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Dealers Who Delay Taking Cars Now *Will Face a Shortage When the Active Selling Season Starts Shortly*

This not being an active selling season, it is quite probable that many dealers do not realize the seriousness of their position as it concerns the future. Every year at this time it is the custom of many dealers to refuse to make any definite arrangements for cars. They have been in the habit of waiting until the demand develops, and then going to their distributors for such cars as they need. They have not been taking any cars lately, and therefore probably do not realize what effect freight embargoes and other influences have had in curtailing production.

It has been impossible to make the usual overland drive-aways from the factories this winter. No dealer has any stock of Hudson Super-Sixes. The production of the new series was started in December. For days, in common with all other manufacturers, we were unable to ship a single car either by freight or by express. Several days have been taken out of production because of the coal situation. It is time taken out of a period when advanced stock is being produced for the spring demand.

With production cut forty per cent, and no one able to guess what further curtailments may be necessary because of freight, labor, coal, the war and other influences, and with the country just getting under way in the greatest distribution of money it has ever known, the prosperity is going to those automobile dealers who have the foresight to get cars just as soon as they can.

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AUTOMOTIVE INDUSTRIES

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VOL. XXXVIII

NEW YORK—THURSDAY, FEBRUARY 21, 1918—CHICAGO

No. 8

Specialization Helps Tractor Industry

Automobile Practice Exerting Its Influence on Tractor Design—Makers of Parts and Accessories Doing Their Part—New Tendencies Revealed at the Two Big Tractor Shows

By David Beecroft

KANSAS CITY, Mo., Feb. 16.—The influence of automotive engineering on the farm tractor industry was well exemplified at the special tractor show which has been running all week and came to a close here this morning, and also at the show held in the Twin Cities last week. Between the two shows upwards of 90 per cent of the tractor industry was represented and this representation included all the large makers with the exception of the Ford, which was not represented at either show.

The interest in the tractors in both cities was greater than that in automobiles and trucks. This was natural, because of the shortage of farm workers and government demands for greater crop acreage this spring, with constantly increasing acreage during the period of the war.

Tractor engineering has made material progress during the past year, both as regards improvement in design, the use of better steels, greater use of anti-friction bearings, more efficient engines, reduction in weight, a better distribution of weight over front and rear heels, and in the more efficient protection of parts from dust and water.

Improvement Largely Internal

The story of improvement does not appear nearly so much on the surface. Externally a machine may be just about as it was a year ago, but Timken or Hyatt bearings may carry the steering and driving wheels in place of the plain bearings used a year ago. It may have an engine that has been revamped in the last year to burn kerosene more efficiently and has water-jacketed spark

plugs, more water space over the cylinder heads, detachable cylinder heads, looser fit pistons, larger crankshaft bearings, perhaps force feed engine lubrication, a new design of gearset with forged gears and ball or roller bearings. These are some of the more important changes that have taken place within the last year. It is a story of the influence of automobile engineering practice, but the improvement has been general, and concerns never connected with the automobile or motor truck industry have profited substantially by designs from these industries.

Many New Tractor Concerns

The unprecedented and unexpected demand for tractors has resulted in many concerns entering, and in this respect it is easier for new firms to enter the tractor industry to-day than it was for concerns to enter the automobile and motor truck industries at a similar period in their development. This is due to the ease with which tractor assembly can be carried on already. Thanks to the production lessons of the automobile industry, there are already makers profiting by the experience of five or six years ago in the automobile industry, and are making parts for tractors. Thus you can secure radiators of tested quality, and there is no activity among tractor makers, excepting those building unusual types of large machines that demand extraordinary capacity. There is not that tendency that existed in the automobile industry years ago for a new concern to develop its own type of radiator. The radiator man has already solved that, and radiator design and construction are in step with the



A special building was put up for the Kansas City Tractor Show and, though it cost over \$18,000, it has been one of the best investments ever made by the trade. There were forty-three different makes of tractors on view

highest standard set in the development of the tractor.

The ease with which tractors can be assembled is further assisted by the engine development. Those engine makers who have built for automobiles and trucks have for several years been working on tractor engines and have been wrestling with the difficulties of handling heavy fuels. To-day they have engines ready for delivery to the tractor industry. They are generally large engine concerns with capacity, but several new firms which will specialize on truck and tractor designs have sprung up. The entire knowledge of truck and automobile engineering has already been swung into tractor engine development.

What is true of engines is also true of ignition apparatus. The magneto, battery ignition, generator, starter and battery engineering practice has already taken hold of the tractor industry. The first tractor with electric starting has been on the market for some time and is manufactured in large numbers. Magneto makers have risen to the occasion to provide dust-proof and water-proof magnetos, and at the show here Remy showed its new tractor job with a spray of water constantly playing over it and another of the same design operating under a bell jar into which was injected a dust cloud.

Ball and Roller Bearings Increase

Bearing manufacturers—both ball and roller—have been active in the tractor field. Hyatt deserves credit for the pioneering work done as well as for the co-operative work carried on with tractor makers. To-day all of the ball-bearing interests are doing excellent work, and their bearings are finding increasing use in gearsets and other parts. The manufacturers of other kinds of roller bearings have been in the field, and their bearings are now found in many parts of different tractors, particularly in the gearset and on the transmission shafts.

The same can be said of carbureter makers, who brought into the tractor field their former experience and added the knowledge they had on kerosene. In handling kerosene the research work of the Wilcox-Bennett organization has been very potent in maintaining the correct perspective in using heavier fuels, and while the kerosene problem is still far from a final solution, in that there is not a job that operates anywhere near as satisfactorily as on gasoline, a great deal of progress has been made, and—best of all—the big job in handling

kerosene efficiently has been impressed on several makers of carbureters as well as on makers of tractors.

With all of this so-called latent automotive energy back of the tractor movement, it is not surprising to find tractor assembly moving much faster than might be expected, and it is not surprising to find in these assembled jobs the last word in modern design and practice. It is a fortunate coincidence that there are so many tested and tried-out units that the assembler can secure, as it should result in that needed speeding up of production which the exigencies of war demand.

There is perhaps one respect in which there is a shortage of tried and tested parts and where the assembler has not that breadth of selection that he has in purchasing engines, magnetos, bearings, radiators, carbureters, etc., and that is in the gearset design. The automobile and truck gearset designer has not been working on the tractor requirements and consequently his jobs are not seen, but their place is largely taken by individual designs developed by the different tractor makers to meet their individual requirements.

Some Gearset Specialists

There are, however, firms that specialize on tractor gearsets, and two companies in particular, Foote and Nuttall, have developed new designs intended to permit the use of live rear axles in conjunction with larger diameter wheels. The Foote gearset permits of using a 60-inch rear wheel mounted direct on the live axle, and the Nuttall design was shown in tractors with 48-inch rear wheels. Neither of these new designs has been tested out, and so the immediate future of the gearset is not a settled point. There is, however, little doubt but that the live axle design will be accomplished in conjunction with a gearset and the necessary wheel diameters for soft-ground use that will give all the reduction needed without undue tooth pressure. The job is not yet done, and tractor gearsets offer an attractive field for design.

Still further, a department that is holding back tractor assembly is the frame design. There is no such thing as a standardized tractor frame. Each frame has been worked out to meet the ideas of the designer. There was only one tractor at the Twin Cities and Kansas City shows that had a heat-treated, pressed-steel frame, and that was the new R. & P. job, the product of the Republic Truck Co. It has a very simple design, with side pieces

bottle-necked slightly in front and then dropped to pass below the back axle. The front cross member is an inverted arch affording a trunnion support for the engine and in turn resting on the center of the axle. The new National tractor, not seen at either show, also uses a pressed-steel frame. Nearly a dozen tractor makers admitted that they were waiting for some firm to bring out a good design of pressed-steel frame, and that just as soon as this happens they will drop their rolled channel job, or their cast-steel job or their made-up contraption and take on the pressed-steel design.

Front axles also offer a good field for the axle maker. The time is ripe to bring out some standard designs of axles. The use of roller bearings in the wheels will hasten the standardized axle. Practically a straight forged design, with Elliott or other types of ends, will fill the requirements.

Tractor Classifications

With such fairly satisfactory avenues to secure tested and proven units, it is not surprising that many new tractor firms should be on hand and that they should have quite reliable jobs. There are perhaps ten of such.

The development of the year has not been confined exclusively to the new assemblers, as many of the old-line makers have improved, although there is one class where the design is not in any way associated with automobile or truck practice, where the development is not so pronounced.

The tractor field literally divides itself into two broad classifications, with a third class occupying a middle position between them. Thus one class may be designated as the farm-implement design, the other the automobile design, and between these the middle class.

This classification does not mean that firms making farm implements follow the first division; in fact, the opposite is the case with several houses, and some of the farm-implement makers have been leaders in exploiting the automobile design; witness Case, Wallis and Rock Island.

On the other hand, there are the implement makers that have a distinctive tractor design, and these constitute the first group. In this are International Harvester, with its Mogul and Titan models; Avery, Rumely, Hart-Parr, Waterloo Gas Engine Co., Fairbanks, Morse & Co. and some others.

In the automobile classification are such names as Case, Wallis, Ford, Samson, Cleveland, Velie, Bates, Four-Drive and several other new names that have come to the front in the last few months. In general this classification adheres to general automobile arrangement with the four-cylinder engine, radiator, gearset and axles in practically the same general layout as in an automobile or truck. They use automobile or truck design of units and aim at the same standard of materials, bearings, weight reduction, etc.

Then comes the intermediate class, including all designs that are in the nature of a compromise between the farm machine idea on the one hand and the automobile idea on the other. In this classification might be placed such firms as Emerson-Brantingham, Twin City in its smaller models, Parrett and some others. They were developed very largely in a machinery atmosphere, but have absorbed very

liberally of the best automobile practice, and all have most efficient machines, leaders in their respective fields. They use the four-cylinder engine, but in transmission and chassis details are not quite in the automobile classification.

With the first classification, the agricultural machinery class, the use of the twin engine, or the single-cylinder design, both horizontal, is general. These are generally large-size engines, with cylinder ranging from 6 to 8 in. in bore and with proportionate strokes. They are heavy constructions and bear little if any resemblances to automobile engine design. The transmission systems are proportionately heavy, with many exposed gears and cast gears used in place of forged designs. The use of anti-friction bearings is not general.

Just when these three divisions will come together or in what form is not within the scope of this show report, but it will form one of the most interesting developments of the future. There are in the farm machinery classification those huge designs of tractors that pull ten or a dozen plows, machines which have wide use in the large areas of the West, and there is some speculation whether these machines will continue or some smaller form of automobile design will take their place.

Two Schools of Engineering

The farm machinery or implement classification and the automobile design represent two entirely different schools of engineering, and the rule that will determine the future of each is the law of the survival of the fittest. There is no doubt that there is some feeling between the two classifications. The farm machinery classification had the field by virtue of priority of manufacture, and what the automobile classification has achieved has been obtained by later manufacture.

There are not a few problems in tractor development that are yet remote from a satisfactory solution. One of these is that of weight and another is wheel diameter and necessary gear ratios. There is practically no definite group that is settled on wheel diameter, and the fact that some of the latest designs range in wheel diameters from 42 to 60 in. indicates the variety of thought.

Exponents of high-wheel machines, say 60-in. diameters, do not think that it is possible to perform all farm work with wheels that are much less than this in diameter. They point to the early plowing necessary for oats, where a field must be plowed before all of the wet spots have dried up, and that a large-diameter wheel is necessary for such work. Some others point to the wheel



A corner of the Kansas City tractor show

diameter necessary for rice farming. Others point to the still greater need for some form of farming where great moisture of soil is essential. The fact that we have with us creeper types, fashioned after the Holt caterpillar; that we have 42 in. wheels, 48-in. wheels, 56-in. wheels and 60-in. wheels on machines intended for practically the same work is evidence of work yet to be done before the eventual is reached.

The question of wheel diameter and tractive effort and drawbar pull is closely associated with that of weight, and nothing definite exists as to the most desirable weight for a three or four-plow tractor. Scarcely any two engineers agree. They are not entirely settled in their own minds.

One concludes that weight up to a certain point is necessary for traction and another holds a different view. One admits that a small-diameter wheel will pull its load on good soil, but not on sandy or soft soil. What is needed is a good series of official tests in which every tractor will be put through the same series of tests that will embrace different soil conditions. This has never been done as yet. Such tests would answer many of the questions that are being asked regarding the performance of creeper machines in different soil conditions. A few strenuous tests such as the automobile industry had in

its early days are needed to-day in the tractor business.

Undoubtedly different designs of tractors will be the eventual solution. It is the history of all industries that at first there is the blanket type of machine that is sold as suitable for every kind of job, but later as the industry develops differentiation sets in and efficiency dictates that it is economically more sound to adapt different designs to different uses.

With the tractor industry we are in that stage where too many makers would like to sell their machines for every kind of soil and would interpret it as a weakness if they admitted that their machine is not suitable for certain localities. This is unfortunate, but it is the price that all developing industries have had to pay for the short-sighted maker.

Differentiation in the tractor industry will be accelerated by good tests, tests which will show efficiency of design, the practical phases of design and the commercial aspects of design. As the motor truck industry developed we watched differentiation take its place. The same was true of the automobile. The same has been taking place with amazing speed in our aviation program. We are witnessing the same in the motorcycle field, and we must not be surprised at it in the tractor field, where we should take no injudicious steps to combat it.

Tractors Show Mechanical Refinement

New Gearsets Permit Use of Large Wheels with Live Axle—Weight Being Reduced

KANSAS CITY, Feb. 16—The newest thing at the Kansas City tractor show was the R. & P. tractor built by Ruggles and Parsons, the moving spirits in the Republic Motor Truck Company. This tractor is perhaps the best exemplification of automobile influence on tractor design and is the first tractor to use a pressed-steel frame, heat treated; it has a special design of Torbensen internal gear drive for tractors, and uses the Italian type of wheel. This tractor represents very close adherence to automobile design in the arrangements of all its parts.

A new tractor, which has not in any sense originated from automobile men, but rather from tractor men, is the Trojan, in which the most important feature is the new Foote gearset, which, with its combined live axle, permits of using 60 in. driving wheels, a greater diameter than has ever been used before with a live axle design. Spring drive in the rear wheels to relieve the gear teeth of shock is used. In working out the job John B. Foote, of the Foote Brothers Gear & Machine Company, has kept tooth pressure low, but has a gearset of considerable weight and employing upward of twenty gears. His reductions are in five stages, the greatest being 16 to 1. A planetary system is used in conjunction with a sliding set, and one bevel reduction at the front end.

The set affords three forward speeds, which in miles per hour approximate 1.5, 2.12 and 4.3. By changing a set of two gears which are outside of the case, but yet enclosed, it is possible to change the entire speed ratio and give a higher ratio of speed, as 2.2, 3 and 6 m.p.h. The cost of an extra set of these two gears is \$16, and by this additional investment the farmer has a tractor with a range of six forward speeds.

To change this set of gears calls for removing a plate on the side of the gearbox and not more than 15 minutes' work. An increase in draw-bar pull of 50 per cent is obtained by this arrangement.

The Foote unit is more than a gearbox and rear axle combination and has a forward extending cradle which supports the engine, constituting in reality about seven-eighths of the tractor frame. The front end of the gearbox ends in a bell housing to fit the corresponding end on the crankcase, S. A. E. standards being used.

All gears in the set are .15 to .25 carbon forgings and are heat treated except the ring gear on the differential, which is a semi-steel casting. The Foote company plans to manufacture this gearset in two models, one for three-plow jobs and the other for six plow jobs.

The Nuttall Gearset

Another new gearset, and one designed for live-axle drive, was exhibited by the Nuttall company, gear makers. It is a combination with the live rear axle and all gears are forged and heat treated and shafts are carried on roller bearings. This set, suitable for a three or four-plow tractor, gives two forward speeds and is claimed to serve with a 52-in. drive wheel and a motor speed of 850 r.p.m. With an engine speed of 900 r.p.m. and 48-in. wheels tractor speeds of 2.5 and 3.5 m.p.h. are given.

This gearset has two gearshafts in front of one paralleling the live axle which is incorporated in the gearbox. At the front end is a bevel reduction from the clutch. The first shaft carries the large bevel and a pair of sliding gears. On the second shaft are two large diameter spurs and the differential. The ends of this shaft carry the small pinions meshing with the large master

gears on the live-axle shafts, which are 22 in. in diameter and 2.25 in. face.

The set complete weighs 1300 lbs. and will be in production for Fall delivery. This gearset is used in the Sexton, a new tractor made in Asbury Park, N. J., and in this job 48-in. wheels are used.

There are many other examples of what changes have taken place in the past year, changes which tell in unmistakable words that the tractor is here and the looked-for development is rapidly under way.

Two-Wheel Designs

Four two-wheel tractors have been shown this year, the leader being the Moline Universal, which has not been changed in design; the Square Turn, a Chicago design, which uses very large wheels and carries the plows underneath the frame; the Noble, of

Kansas City, which uses a Continental block engine carried on a framework swung between the two 60-in. wheels, and the Beeman, which is a miniature cultivator resembling a hand one.

New Creeper Type

The Belt-Rail, as its name suggests, is a creeper type with two steering wheels in front. This has been developed by the Beltrail Tractor Company, St. Paul, Minn., by the interests that make Crex matting. This concern used 3600 horses on its farms where the special grass for making this matting grew. It required a machine that could operate well on soft ground to do the work, and the creeper type is the result. The design has been well worked out, using a four-cylinder Waukesha engine, a two-speed transmission, with Hyatt bearings, worm-and-segment steering, Bennett air cleaner, etc.

Features of Some of the New Tractors

THE J. T. tractor, the first model of which was brought out two weeks ago, is a wheel-less creeper design with a long creeper on each side having 57 x 8 in. ground contact. Each creeper rides on a train of idler pulleys and is driven from a large rear gear that in turn receives its power through an internal gear drive entirely inclosed. Steering is by use of internal brakes acting on the differential, one brake on each half of the differential.

The four-cylinder, block, valve-in-head Erd engine burns kerosene, the J. T. carburetor working in conjunction with an exhaust jacketed manifold. With the engine at 800 r.p.m. the three forward speeds are 1.25, 2.5 and 5 m.p.h. The gearset is made by the Detroit Gear & Machine Co. and the jackshaft by the American Ball Bearing Co.

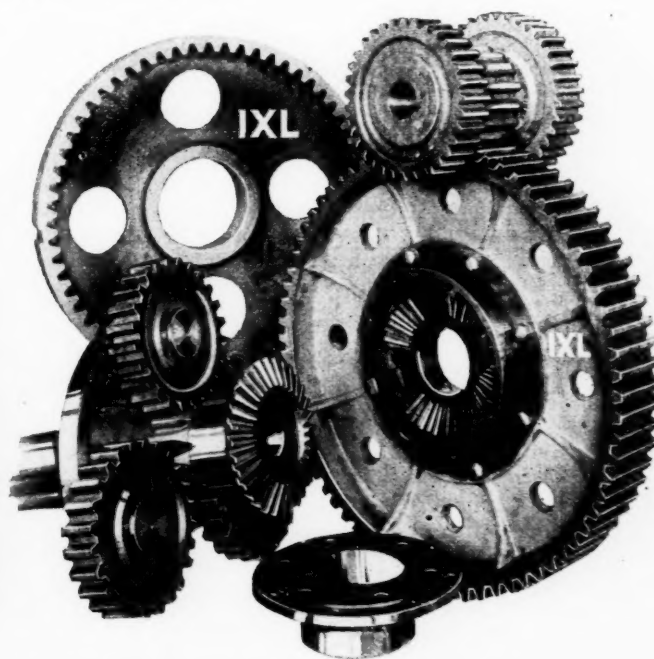
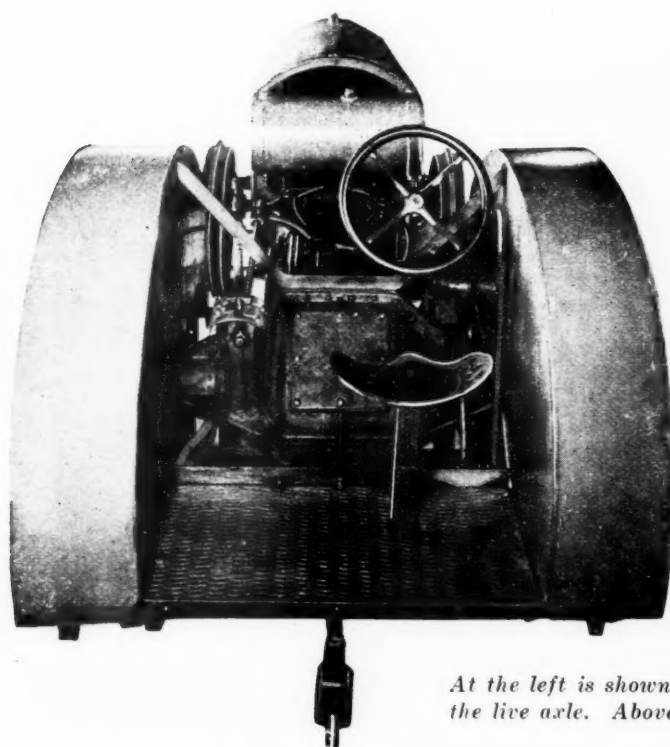
The J. T. Tractor Co., Cleveland, Ohio, occupies a three-story plant and hopes to assemble 5 machines per day in 6 months. George P. Comey is president, J. J. Tracy, chief engineer, H. L. Lance, general manager and C. E. Grove, salesmanager. The company has not yet built up its distributing organization.

Fair-Mor is the new tractor name for Fairbanks, Morse & Co. the large builders of railroad supplies, including a line of gasoline engine trucks for section work, which have been marketed for many years. The Fair-Mor tractors have been

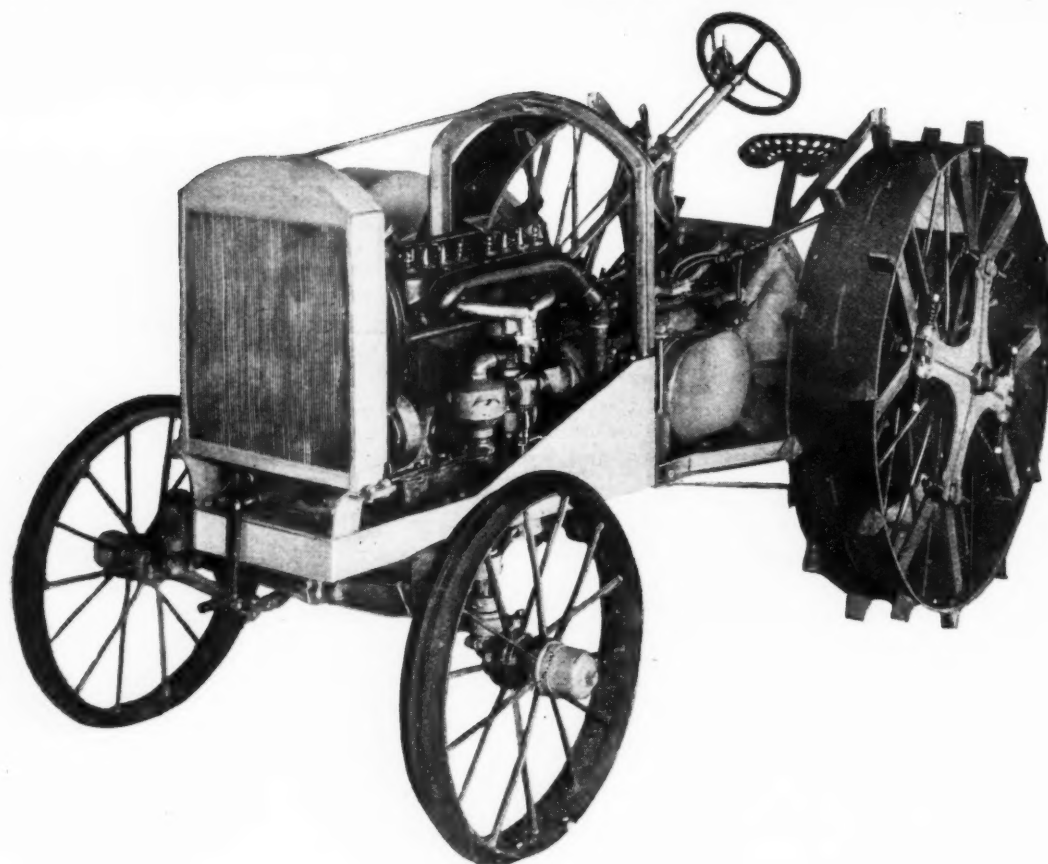
made for several years, but largely for export, and have only now been introduced into the great Mississippi farming belt. There are two models, both of which burn kerosene and use twin-cylinder engines of slow-speed design (400 to 600 r.p.m.).

The larger model, a 12-25 job for three plows, is built as an imitation of a steam traction engine, with the cellular radiator as the body, the twin-cylinder engine lying on top of the rear end of the radiator and the gearset and fuel tank forming the firebox. The rear wheels are 56 by 18 in. and the engine cylinders 6.5 by 8 in. The radiator is closed at its front end and the air enters through the rear and travels forward, escaping through the funnel on top. This air circulation is maintained by the exhaust, which escapes at the front of the radiator and also in the base of the funnel, thus creating an air draft.

Kerosene is pumped by plunger pump into a globular chamber of about carburetor size at the front end of the engine, or close to the cylinder heads. This globe is heated by the exhaust, and as the kerosene is sprayed into it hot air also enters to take up the kerosene. On its way to the cylinders a current of cold air is added to increase the power. A butterfly throttle controls the flow of mixture. The radiator capacity is 100 gal. and the total weight is given as approximating 5500 lb.



At the left is shown the rear of the Trojan tractor and the housing for the live axle. Above are the component parts of the Foote gearset with which the tractor is equipped



The Trojan tractor is one of the first to have very large drive wheels used in conjunction with a live axle. This is made possible by the use of the new Foote transmission, component parts of which are illustrated on the preceding page

The smaller Fair-Mor model is a conventional design but much the same in principle, using a twin-cylinder 6 by 7 in. engine, which runs at 600 r.p.m. Its rating is 10-20 and, like its larger brother, it has large drive wheels with inclosed drive. It has direct pulley drive for belt work.

Coleman Worm Drive

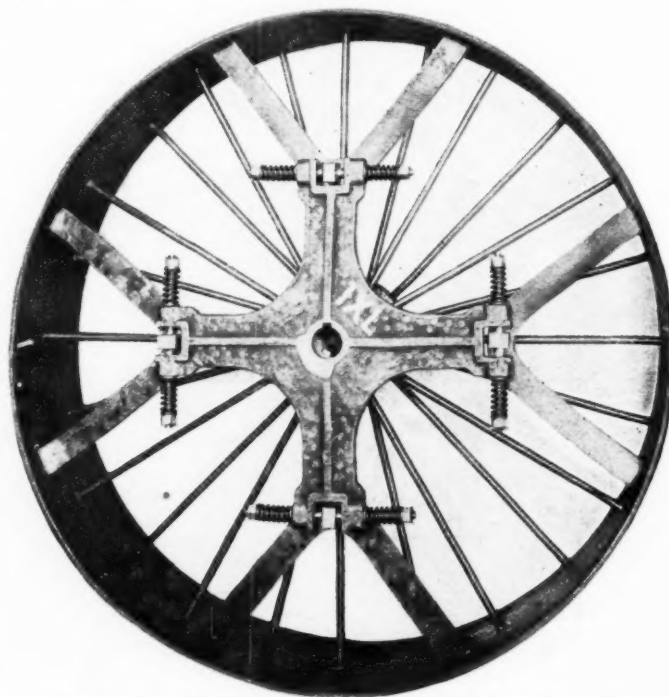
One of the few worm drive tractors aside from the Fordson, the new name for the job made by Henry Ford and his son Edsel, is the Coleman, of which perhaps thirty have been made to date, although development work was started several years ago and manufacture begun a year ago. The worm mounted on top of the wheel in the rear axle is used in connection with a two-speed gearset. The worm and wheel give a reduction of fifty to one. The wheel is 26 in. in diameter, and the worm 4 in. in diameter, six teeth of the wheel being constantly in mesh with the worm. The worm is mounted on Timken bearings and has special provision for lubrication. The live rear axle is carried on Hyatts, as is the differential.

The engine is a four-cylinder block Erd. Forged gears are employed in the gearset. The rear wheels are relatively small, 42 in. in diameter on the small model and 46 in. in diameter on a larger model.

Plano Tractor

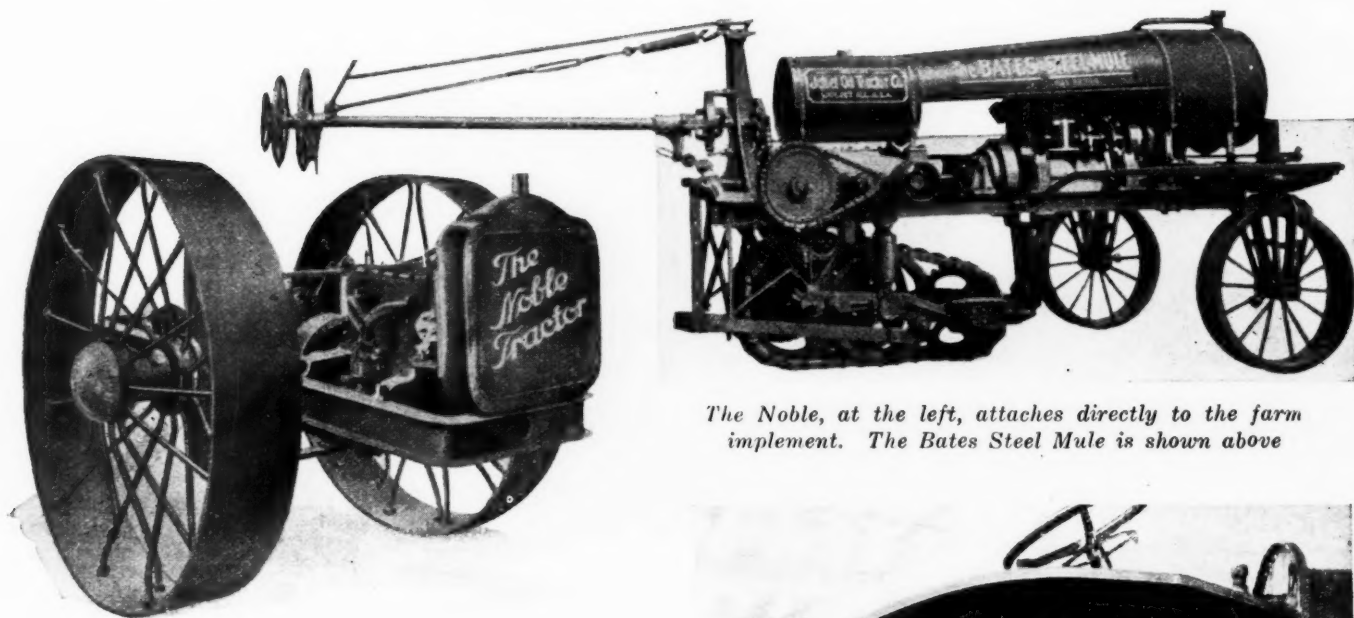
The Plano Tractor Co., Plano, Ill., began tractor development 2 years ago and have just started production on a new four-wheel design using a 4¼ by 5½ Buda engine, which drives through a Plano design of gearset to the rear drive wheels, which are 42 by 12 in. There is a total reduction between the engine and rear wheels of 49 to 1. The front wheels are also large diameter and having the frame very narrow at the front gives the job good maneuvering ability. The frame is cast steel and almost yoke shaped with the narrow end or stem of the yoke in front. The weight distribution is such that 30 per cent is over the front wheels and 70 over the rear. The drive wheels carry large manganese steel gears which are intended to be run without lubrication and are guaranteed for 2 years. In the two-speed gearset cast gears are used and shafts are carried on Hyatts. The radiator is back of the engine and just to the left of the operator's seat.

Use is made of a special water air filter made by the company. It is inclosed in a rectangular box which is two-thirds filled with water and is kept at this level from the radiator system. The box is divided horizontally into upper and lower halves by a metal plate. Air enters the lower half and in passing through the water is led through a devious course by a series of vertical baffle plates attached alternatively to the top and the bottom of the compartments. The double-bowl Kingston carbureter consumes kerosene.

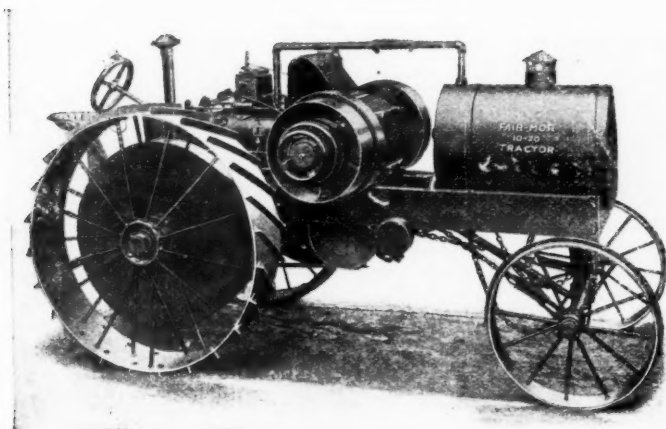


The Trojan tractor uses 60-in. wheels driven by a live axle, the driving strain being softened by a spring arrangement shown in this view

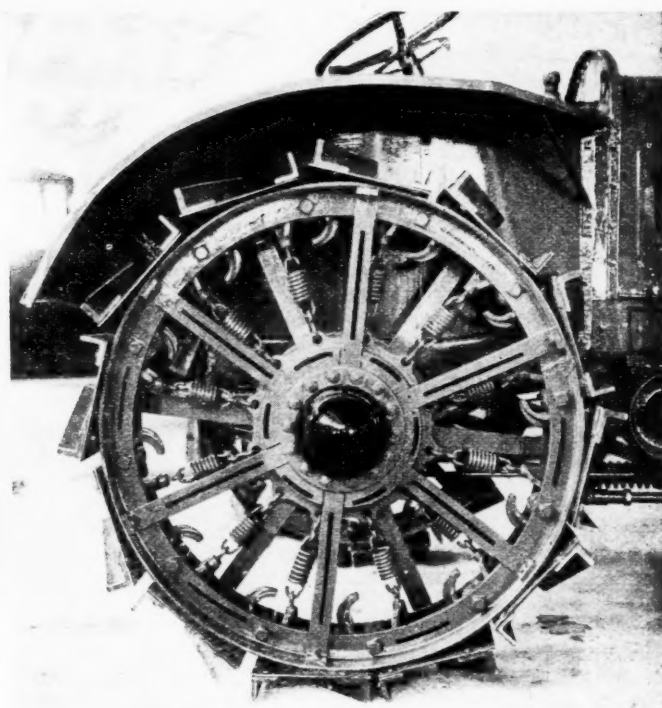
Some of the New Tractors at Kansas City Show



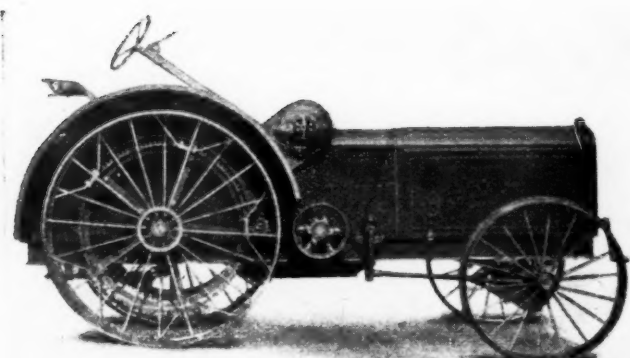
The Noble, at the left, attaches directly to the farm implement. The Bates Steel Mule is shown above



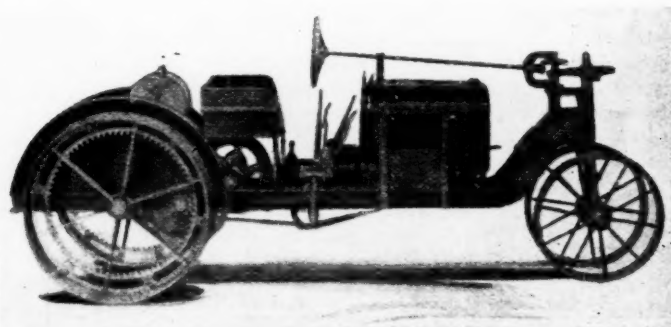
The Fair-Mor tractor follows already familiar principles in design and construction and, like many modern machines, has four wheels



The wheels of the R & P tractor are styled "pad" wheels and are the same design as are used on military tractors in the Italian army



This is the standard Emerson-Brantingham tractor with four wheels and the engine under a forward hood



The Avery has internal gear drive

Effects of Low Temperatures on Starting*

Reduction of Battery Capacity and Terminal Voltage with a Decrease in Temperature—Congealing of Oil and Decrease in Efficiency of Starters at Low Speeds

By O. W. A. Oetting

Engineer of the Willard Storage Battery Co.

THE starting troubles encountered because of cold weather conditions such as we have experienced during the past three months are most exasperating to the car user, but in the majority of cases are avoidable if all the effects of low temperatures have been anticipated by the automobile designer. The proper application of the electric starter and storage battery for use on passenger cars, motor trucks and tractors presents problems to the engineer which if properly solved will prevent some of the troubles which frequently have occurred in the past.

No apparatus is required to operate under such a variety of conditions as the automotive engine and its accessories. The range of temperature from the heat of summer to the freezing cold of winter is one of the conditions that must be appreciated in making the proper application of the storage battery for this service. The storage battery can be made that will operate in a satisfactory manner under these extreme conditions, but engineers must take into consideration certain facts. In cold weather the capacity and the voltage of a battery are less than they are at normal temperatures. Likewise, it is much more difficult to start an engine because of the effects of these low temperatures on the lubrication and also the carburization of the fuel. In

addition to these facts, we find that the efficiencies of the electric starting motors are considerably lower at the low weather conditions. In determining the size of the storage battery the power required to start the engine under these cold weather conditions must be used as a basis.

Considerable data on cold weather starting have been secured. It is the purpose of this paper, first, to give a short résumé of these tests and, second, to summarize these results so as to predict, if possible, the size of storage battery that is required for starting any engine, giving the approximate ampere-hour battery capacity in terms of the piston displacement of the engine.

Battery Sizes

Heretofore, not enough attention was given to the size of storage battery that was required on a car and almost invariably a smaller size of battery was used where a larger battery would have given better service under all conditions. This haphazard application of the battery shows great inconsistencies when a plot is made of the battery sizes against the engine displacements, as shown in Fig. 1. The data for this plot are taken from a list of all the 1917 passenger cars and are no doubt representative of present day practice. It can be seen that the 80 amp.-hr. battery is used on cars having piston displacements from 95 to 425 cu. in. On the other hand, the 100 amp.-hr. battery is used on cars with displacements ranging from 170 to 425 cu. in. Undoubtedly, cars with piston displacements over 200 cu. in. should be equipped with a larger battery than 80 amp.-hr. and those with displacements greater than 250 cu. in. should have a battery larger than 100 amp.-hr. The plot in Fig. 1 is correct only if the gear ratios between the starter and engine are the

*Paper read before the Cleveland Section of the S. A. E. on Feb. 15.

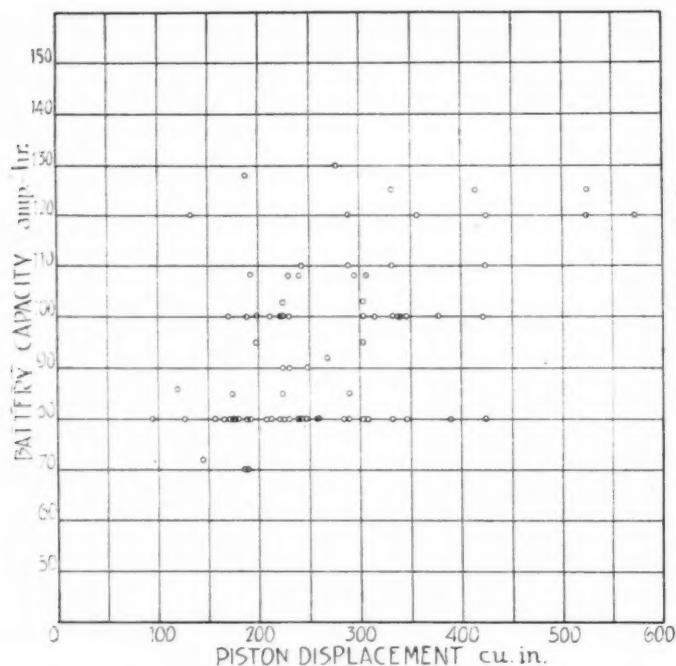


Fig. 1—Comparison of size of storage battery with engine displacement on 1917 passenger cars

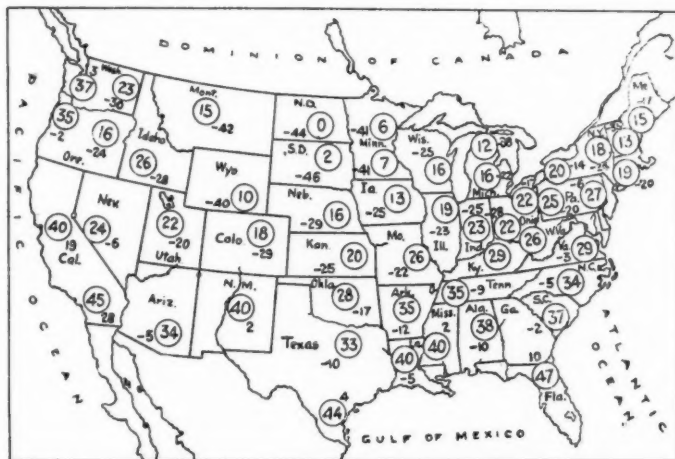


Fig. 2—Average temperatures in various localities throughout the United States during 3 winter months. Small numbers beside circles give absolute minimum temperatures during this period

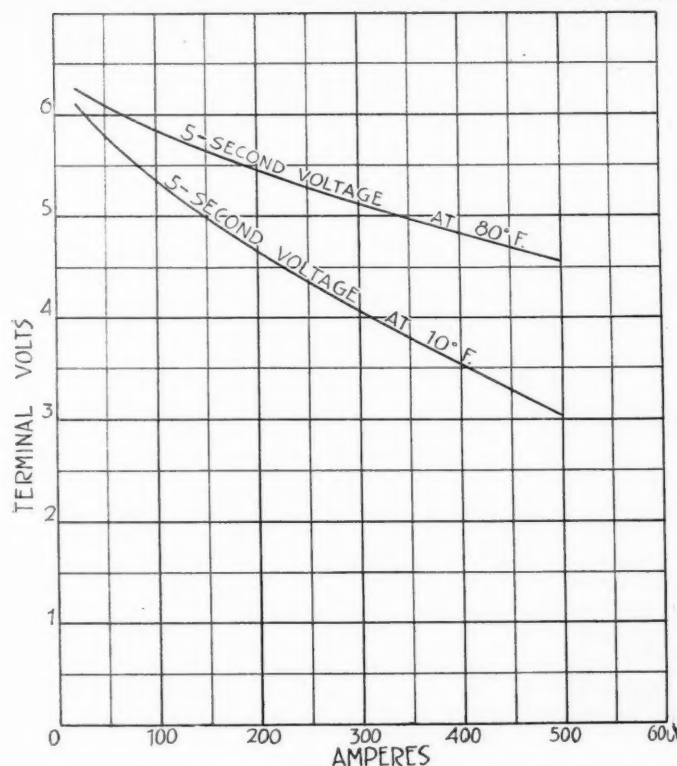


Fig. 3—Comparison of voltage characteristics of 100 amp. hour storage battery at 80 deg. Fahr. and 10 deg. Fahr.

same. On the present day cars this is practically so, as the majority of the cars are equipped with the single gear reduction with ratios approximately equal to 10 to 1.

With the purpose in mind of securing some factor that will determine definitely the size of battery required for every size car, engines were tested with their starting motors and batteries in a large refrigerator to find the actual power required to turn over the engine at various temperatures. The exact minimum of temperature at which the engine should start promptly is, of course, debatable.

A temperature of 10 deg. Fahr. has been found to be a good basis for cold weather testing. Fig. 2 shows a chart which was compiled from data on temperatures obtained by the U. S. Weather Bureau. The figures within the circles are averages of the temperatures observed for a long series of years at various stations throughout the United States during the winter months. The small figures beside the circles give the absolute minimum temperatures at the same localities during this period of time. It will be noted from this chart that only three States have an average temperature lower than 10 deg. Fahr. If then we take 10 deg. Fahr.

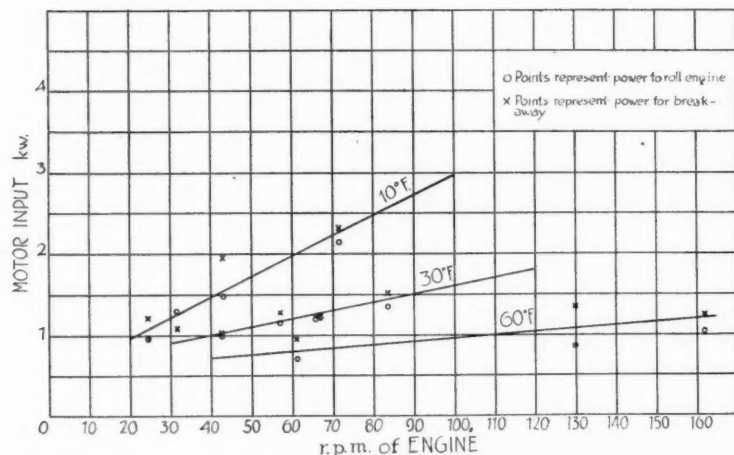


Fig. 5—Power required at various temperatures for starting a four-cylinder engine of 171 cu. in. displacement

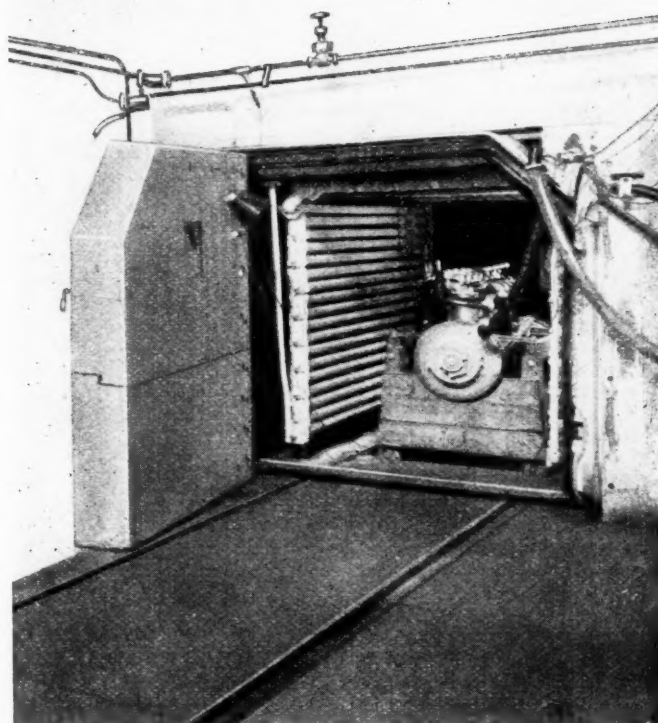


Fig. 4—A refrigerating machine and cooling chamber for testing engine with starter and battery at low temperatures

as a cold weather standard and design the engine and all the automobile accessories to operate properly at this temperature, little trouble should be experienced during the winter months and satisfactory service from the apparatus will be assured.

One of the effects of low temperature on a storage battery is to lower the terminal voltage, especially at the high rates of discharge that are required by the starting motor. Fig. 3 shows the "five second voltage" curves of a 100 amp.-hr. battery at 80 deg. Fahr. and at 10 deg. Fahr. By the term "five second voltage" is meant the voltage that a battery will give at the end of five seconds at a certain discharge rate of current. In other words, the battery shown in Fig. 3 will have a voltage of 4.82 after five seconds' discharge at 400 amp. at a temperature of 80 deg. Fahr. It will be seen from this curve that this battery would not be suitable for an engine with a starter requiring 300 amp. at 4.5 volts when the temperature was 10 deg. Fahr. or lower. Curves such as these should be used in all starting motor designs.

Fig. 4 illustrates a refrigerating machine and cooling chamber used for testing an automotive engine with its

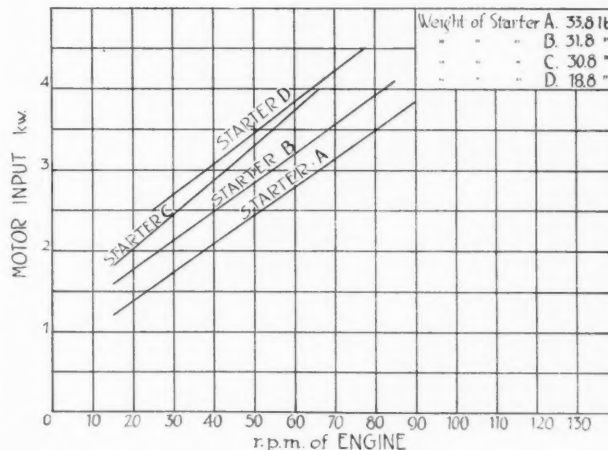


Fig. 6—Power required at 10 deg. Fahr. by four different types of starters on a six-cylinder engine of 268 cu. in. displacement

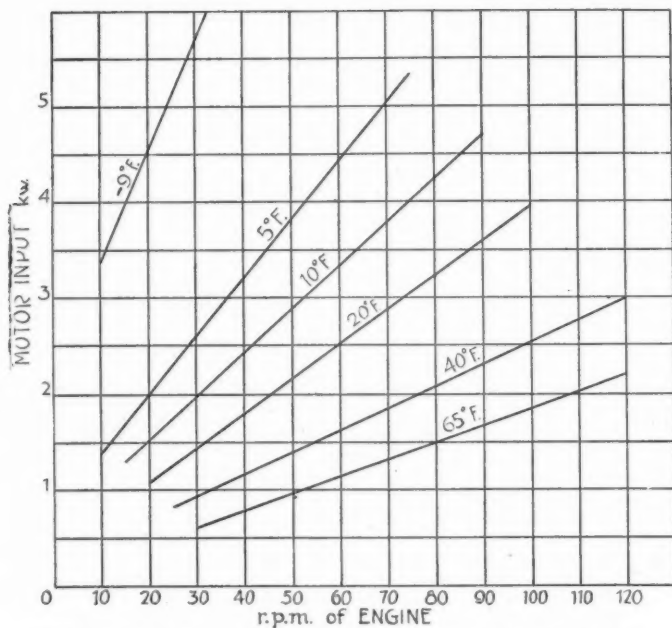


Fig. 7—Power required at various temperatures by starting motor on an eight-cylinder engine of 332 cu. in. displacement

starter and battery at low temperatures. This refrigerator can be cooled to a temperature as low as -30 deg. Fahr. The engine to be tested is placed within this box and wires are brought out from the battery and starter to read the electrical input required to start the engine at low temperatures. A thermometer and some anti-freeze solution are placed in the cooling chamber of the engine and the temperatures can be observed from the outside of the box by means of a small observation door in the main door of the box. The revolutions of the engine are obtained by means of an electrical contactor scheme which rings a bell outside of the refrigerator. After the starting data are obtained at the normal room temperature, the box is slowly cooled to any desired temperature and the starting characteristics of the engine at this temperature are then observed.

Table I gives the results of a test on a certain four cylinder engine having a piston displacement of 171 cu. in. The values in this table give the power that is required to break away the engine and then roll it at a certain speed and temperature. These results are plotted in Fig. 5, the curves showing the average power used for the breakaway and roll of the engine at various engine speeds and temperatures.

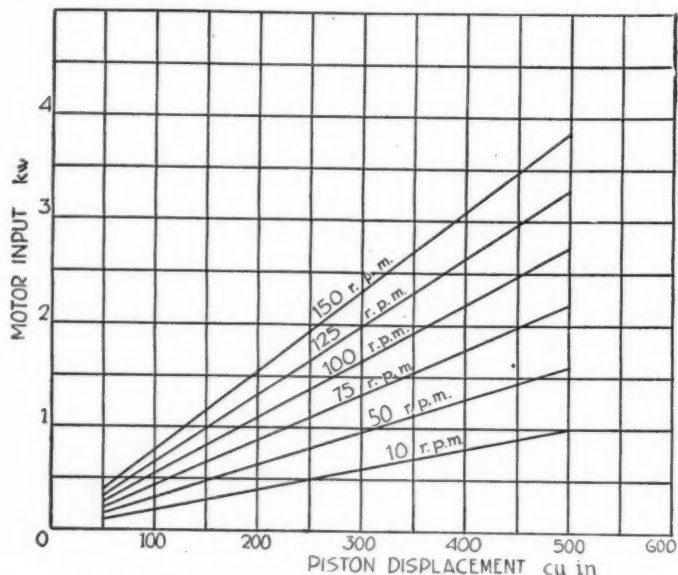


Fig. 9—Approximate power required to break away and turn over various sizes of engines at normal temperatures

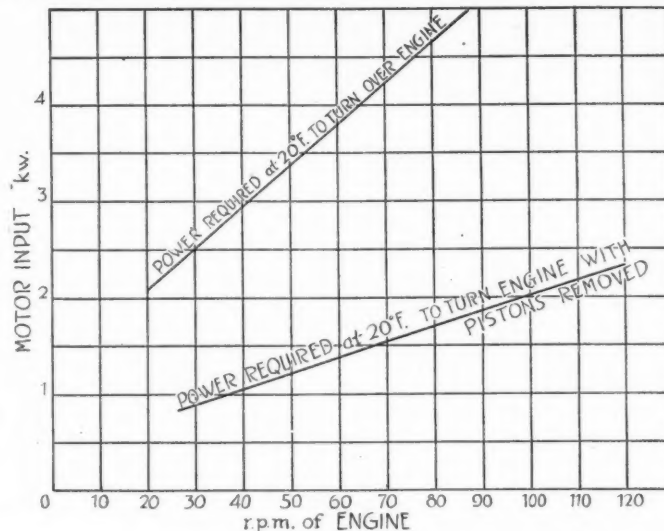


Fig. 8—Test showing comparison of power required to turn a six-cylinder engine of 303 cu. in. displacement without pistons and connecting-rods

The engine in this test had one cylinder which required about 50 amp. more than any one of the other three cylinders during the roll of the crankshaft. This, however, is the service that is demanded of a new storage battery on a car, as the engines often are not "run in" sufficiently before shipment is made by the car manufacturer. A 90 amp.-hr. battery at a temperature of 10 deg. Fahr. turned over this engine at a temperature of 8 deg. Fahr. at 30 revolutions per minute.

A considerable variation in the power demanded from the storage battery is caused by a poor design and application of the starting motor. Fig. 6 shows curves of power used by four different types of starters on a certain six cylinder engine. The light weight starter D requires about one kilowatt of power more than the starter A, in which the proportions of the various parts were more liberal. These curves indicate that the tendency to a lighter and cheaper starter will result in the necessity of the use of a larger storage battery. The automobile engineer must therefore decide where a compromise between the battery and starter will give the best economy and service. In the case of the engine in question, starter B was used. At 30 deg. Fahr. this starter with a 120 amp.-hr. battery rolled the engine at a speed of 30 revolutions per minute.

In Fig. 7 are shown curves from an eight cylinder engine having a displacement of 332 cu. in. This engine was made

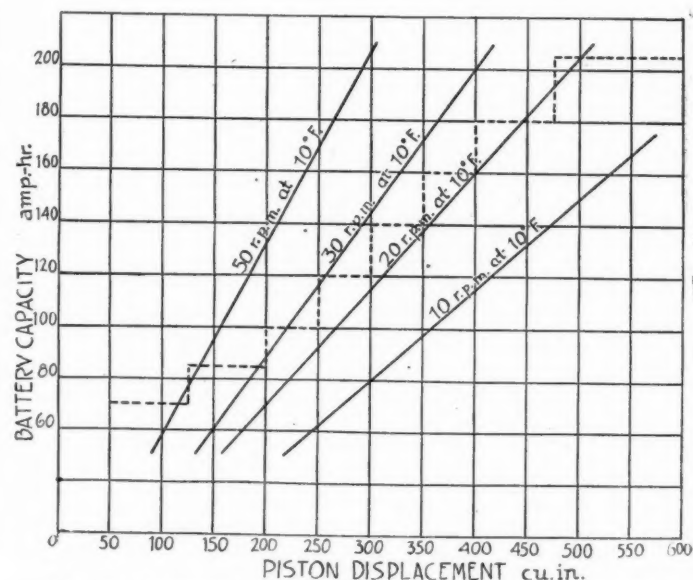


Fig. 10—Approximate power required to break away and turn over various sizes of engines at 10 deg. Fahr.

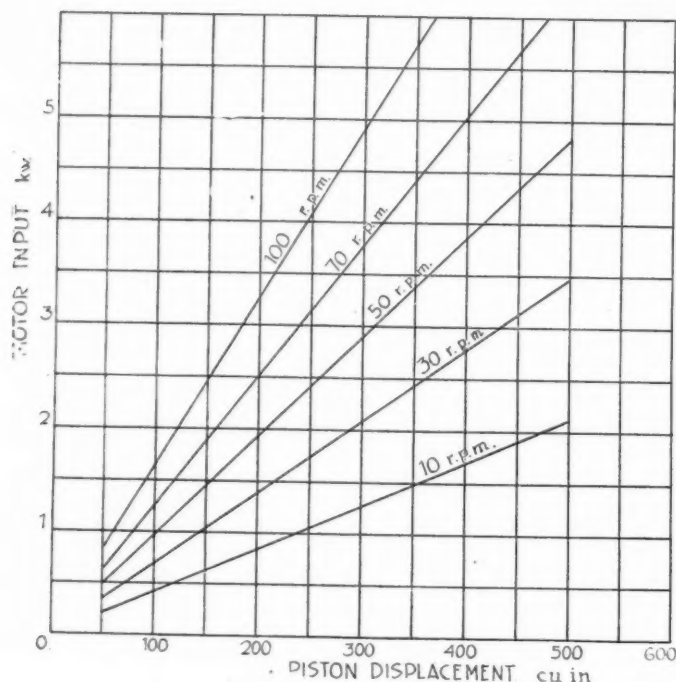


Fig. 13—Minimum battery sizes satisfactory for starting service for 6-volt starting with gear ratio about 10 to 1

One of the features that was brought out very forcibly in the low temperature tests was the effect of the cold on the viscosity of the lubricating oils. As the temperature decreases, the viscosity increases and causes a much greater resistance to turning. One certain grade of oil became a solid mass at these low temperatures. A medium grade of oil in another test was found to have the consistency of extra heavy oil when cooled at 10 deg. Fahr. Therefore, a light or medium grade of oil of a quality that will not lose its lubricating properties at 10 deg. Fahr. or hinder the successful operation of the starting system should be used on cars during the winter months.

Another of the features noted in these investigations, viz., the effect of low temperatures on the ignition system, showed clearly one of the reasons for the adoption of battery ignition in place of magneto ignition. At the low cranking speeds encountered under these cold weather conditions, the cranking speed was seldom rapid enough to fire the fuel in the cylinders when the magneto was used. However, when a battery of sufficient capacity is used to turn over the engine successfully, the battery voltage will always be high enough to fire the engine equipped with a well designed battery ignition system.

The grade of fuel and also its carburization have a great influence on successful starting at low temperatures. The installation of a good electrical system will be utterly negative in results, if the grade of fuel or poor carburization keeps the engine from firing. If the electrical system turns over a cold engine at some reasonably high speed, it should be unnecessary for the car user to be put to the inconvenience of heating the carburetor and manifold of the engine to cause the ignition of the fuel.

Conclusions

1. The size of a storage battery for starter service is determined by the power required to start and roll an engine at some reasonably low temperature (10 deg. Fahr.) at a sufficient speed to cause ignition.
2. Starting troubles may be due to various causes, viz., lack of battery capacity, improper application or insufficient size of starter, viscosity of lubricant at low temperatures, faulty ignition, poor carburetion, or an inferior grade of fuel.
3. A good design of engine and its accessories should take into consideration all of the causes and provide for satisfactory starting at a temperature no higher than 10 deg. Fahr.

4. At 10 deg. Fahr. the available battery capacity is approximately 50 per cent of the normal capacity and the voltage at this temperature also is reduced to a considerable degree.

5. At 10 deg. Fahr. the efficiencies of the starting motors vary between 10 per cent and 40 per cent for the low cranking speeds encountered at these low temperatures. A design of motor should be used which gives better starting torques and higher efficiencies at these low speeds, even if it is necessary to sacrifice some of the normal temperature cranking speed.

Better Starting Characteristics

6. A convenient double reduction gearing between the starter and the engine flywheel can be made that will give better starting characteristics under cold weather conditions than a single gear reduction.

7. A good quality of lubricating oil and a good grade of fuel are requisites for satisfactory starting.

8. As there is a wide divergence in the design and manufacture of the various automotive engines, each design of engine should be tested separately to determine the power that is required to start it under cold weather conditions. In the absence of such data, the approximations derived in this paper should be useful.

Table I

Motor		Amperes		Watts		Speed Temperature	
Break	Roll	Break	Roll	Break	Roll	R. P. M.	Degrees F.
4.75	4.0	200	175	950	700	61	60°
5.20	5	260	175	1350	875	130	60°
5.9	5.75	210	180	1240	1035	162	60°
4.15	3.60	245	275	1020	990	42.5	30°
4.60	4.25	280	270	1285	1150	57	30°
4.70	4.25	260	280	1220	1190	65.5	30°
4.50	4.25	275	285	1240	1210	66.5	30°
5.60	5.10	260	265	1510	1350	83.5	30°
3.90	3.4	310	280	1210	950	24.5	10°
3.70	4.2	290	310	1075	1300	31.5	10°
3.90	4.2	315	300	1230	1260	33	10°
5.80	4.5	335	330	1950	1485	43	10°
6.10	5.5	380	390	2320	2140	71.5	10°

Figures in columns headed "Break" are the instantaneous readings taken the moment the circuit closed.

Figures in columns headed "Roll" are the average readings taken while the motor was rolling.

Hubbell Toggle Switches

A LINE of switches for automobile work is being manufactured by Harvey Hubbell, Inc., Bridgeport, Conn. One of the switches made is a single pole toggle type. It is adapted for controlling light circuits. By pushing the handle up and down the lights are turned on and off respectively. This switch has a maximum load capacity of 50 watts.

For operating electric horns the concern manufactures a momentary contact switch. When the handle is pushed up the circuit is closed, and when the pressure is removed the toggle is released and the circuit opens. The two switches thus far described are designed for flush mounting on the dashboard or instrument board, and the handle, of course, projects to the rear of the instrument board. The firm also manufactures a switch with a recessed plate in which the handle projects only very slightly from the plate and cannot catch in the clothing of the occupants.

A lock switch is also made, for use either in lighting or ignition circuits. A special two tone horn switch gives two contacts and permits of producing either a low or a loud tone by means of the same horn. When the handle is pushed into the perpendicular position one of the circuits is closed, and when it is pushed further this circuit is broken and the other circuit closed.

The switches are furnished either as single switches or in side-by-side or tandem gangs up to four. The standard finishes are nickel and black.

Holley Heavy Fuel Devices

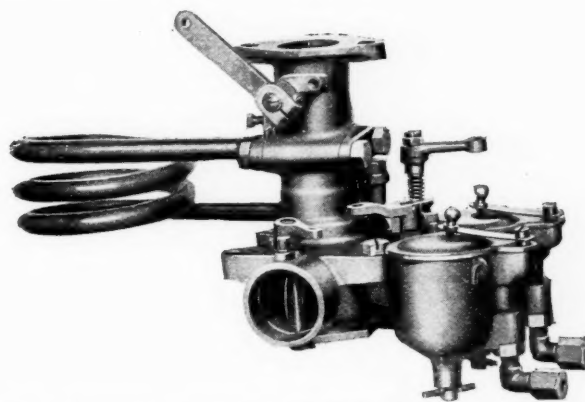
Kerosene Carbureter Applicable to Any Car and Vapor Manifold for Ford Cars to Be Manufactured by New Concern

THE Holley Kerosene Carbureter Co., which took over the Holley kerosene carbureter and the Holley vapor manifold for Ford cars from the Holley Bros. Co., is now in production on these two specialties and is placing them on the market. The Holley gasoline Ford carbureter has been sold, together with the facilities for manufacturing it, to the Ford Motor Co.

The Holley kerosene carbureter, universal type, is an adaptation of the Holley kerosene vaporizer which was described in *AUTOMOTIVE INDUSTRIES* May 3, 1917, page 870. The type then described was intended for Ford Model T cars and was also adapted for the tractor manufactured by Henry Ford & Son. The present model can be adapted to any type of engine; it is sold to the manufacturer directly and can be installed by making simple changes in the manifold castings to include the heating coil which is a part of the Holley system. The device is designed to use any hydrocarbon fuel with a final boiling point below 600 deg. Fahr. It starts with gasoline and after a short warming-up period the feed is switched to the heavy fuel for running. There are two float chambers to take care of the starting and running fuels.

Principle of the Device

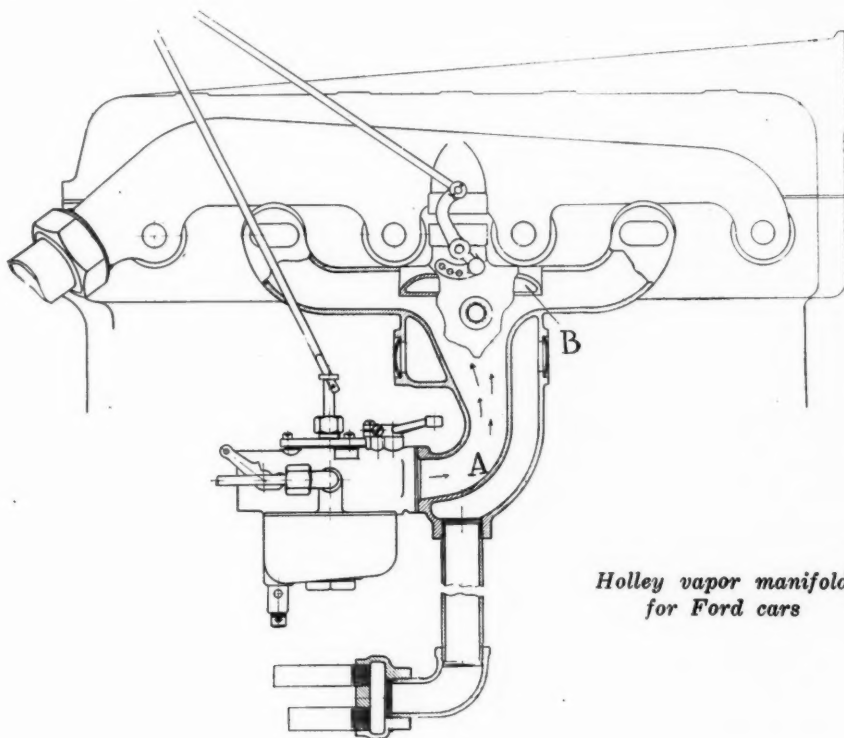
The principle upon which the device operates, as described in the previous issue of *AUTOMOTIVE INDUSTRIES*, is to first provide a primary mixture by means of a needle valve and a very small aspirating jet, which gives a mixture that is too rich for combustion. This rich mixture of atomized fuel and air is carried through a coil tube of very thin wall thickness exposed to the exhaust gases directly in the exhaust manifold. The temperature in the tube reaches 500 deg. Fahr. From this coil the rich mixture is led directly to a mixing chamber where additional air enters, diluting the mixture to make it combustible. The opening of the air in the mixing chamber is governed by the suction of the motor and by the



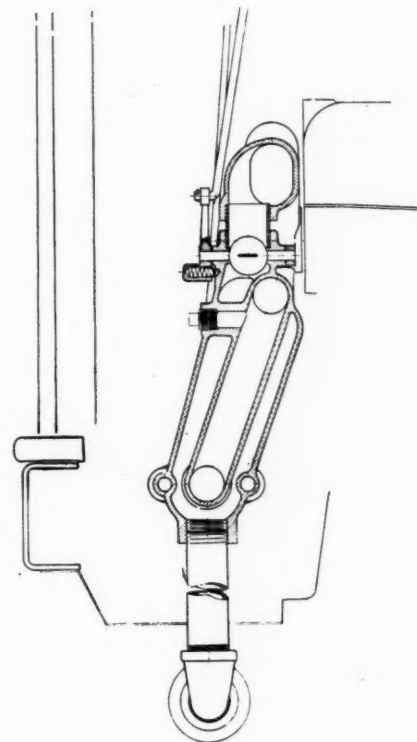
Holley kerosene carbureter complete with vaporizing tube

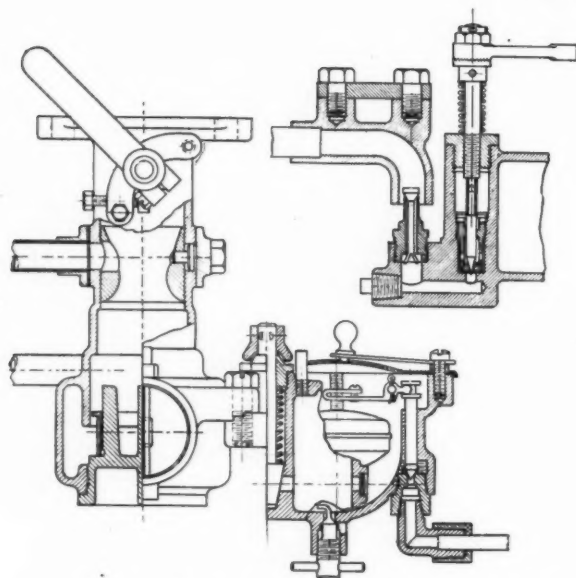
opening of the throttle valve. To install this device on any engine it is necessary to arrange the manifold casting so as to inclose the vaporizing coil. There is also a device with a bypass which controls the amount of exhaust heat passing the vaporizing coil.

The application of the unit depends upon the design of the engine. The average gasoline powerplant should have the compression reduced to avoid overheating and consequent pounding, but the amount of the reduction is a matter of experiment and depends on the efficiency of the cooling system. Cooling defects, which are passed by unnoticed with gasoline fuel, come into prominence when kerosene is used, and are signalized by preignition and consequent pounding. It is possible to maintain the high compression by the introduction of water in the form of steam into the intake mani-



Holley vapor manifold for Ford cars





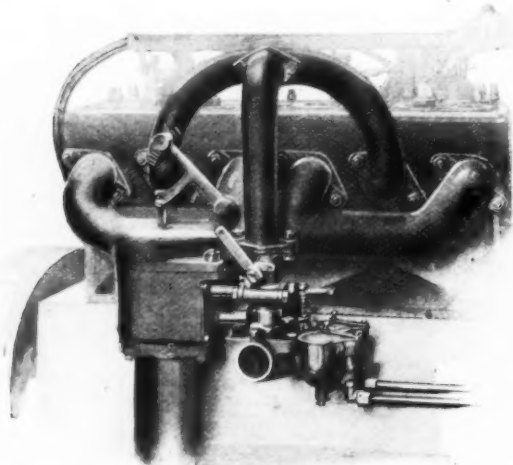
Assembly drawings showing construction of Holley kerosene carbureter

fold, and this can be done by locating the water injection pipe near the exhaust manifold and using the heat therefrom.

There are also some details that must be taken care of in an installation. A small auxiliary tank must be provided to hold gasoline for starting, while a larger tank should be arranged for the main supply of kerosene fuel. The shifter valve for changing the operation from gasoline to kerosene should be conveniently connected to the dash or control board so that as soon as the motor becomes warm, an immediate shiftover can be made. A primer located in the manifold, just above the carbureter side, aids in cold weather starting.

The accompanying sectional view shows a heated manifold adapted for Ford cars. This has been put on the market by the Holley Kerosene Carbureter Co. and is intended to completely vaporize gasoline by applying heat at the proper point. As will be noted from the arrows, the exhaust gases pass down, striking a hotspot at the top of the internal intake passage. The exhaust gases flow along this intake passage and finally pass out at the bottom. The heavy particles of fuel, after leaving the carbureter, strike against the wall at the point A and there are broken up by the heat from the exhaust gases. Should any of the particles not be broken up at this point they will be vaporized when they strike the hotspot at B, as this is directly in contact with the exhaust gases close to the cylinder.

It will be noted that the heavy globules are subjected to a rising temperature, starting at the point A with a lesser degree of heat and finishing at B with a maximum. A control valve is fitted regulating the amount of heat passing the intake manifold.



Typical installation of Holley kerosene carbureter

Importance of Aircraft Standardization

THOSE who have followed events related to the war will have noticed repeated changes in the organization of the British aerial service. Evidently the aerial fighting forces of our ally have not gained strength as rapidly as was expected, and one of the reasons therefor is the failure to fix upon a limited number of approved types of engines and planes and turn these out in the greatest possible numbers. Commenting on the situation, *Engineering* says:

Changes in Air Force Organizations

Events have been moving rapidly of late. They have provoked a crisis in the demand for men, which emphasizes the urgency of the right utilization of woman-power. The Air Council that has been formed to co-ordinate the needs of the air services has transferred the control of production to the Ministry of Munitions. This week it is announced that the French Air Board came silently into being some three weeks ago. Its head is the Minister for Armaments, and it was engaged nightly for the first fortnight in speeding up the construction of machines, in addition to reorganizing the service. Our American allies . . . have attacked the problem from the outset with the closest possible standardization and the fewest possible types.

The actual complexity and comparative novelty of an aero-engine and its accessories make the selection of designs more dependent for the time being than other classes of constructions on ascertained practice, just as the multiplicity of its parts makes an exceptional call for the use of the best methods of manufacture. A great volume of practice is already available in the experience of those who were concerned in making internal-combustion engines long before a practice of aviation had been created. It is not a complete aero-engine practice; but it is the basis of the aero-engine practice or practices developed during the war, and the best available body of information for criticizing and co-ordinating the construction of aero-engines.

Selection of Designs

A safe decision in the selection of aero-engine designs cannot be made without taking account of the older practice; and now, when the works in which these engines and their accessories and spares are made must be regarded as a single establishment working for a single air service, the smallest possible number of designs must be selected for manufacture if the maximum output is to be attained. The Production Department that now serves the Air Council in the Ministry of Munitions should surely be able to realize for itself that this selection of designs is necessary. It must also know that a single policy cannot be defined with the prospect either of yielding the best result or of commanding the widest confidence unless it has been formulated or approved in the light of the best available knowledge of internal-combustion engine practice; and it should not need the interposition of another department to persuade it that this indispensable condition cannot be assured unless the material to be considered has been weighed by some man or small body of men having the necessary familiarity with this practice.

British Now Have Over 40 Types

At present the service is far from enjoying the benefit of any such selection. We are credibly informed that over 40 different types of aero-engines are now being manufactured in this country, and about as many firms engaged in their manufacture. The labor absorbed in the extravagant multiplication of tools, jigs, gages, drawings and patterns, regrettable though it is, does not end the burden on the air service through this variety of designs. The effect, for instance, on the stocks of spares may easily be imagined; and, as we understand, the engines are so different in construction that aerodromes at the front not only require separate spares for the several types that are used there, but have also to keep for purposes of overhaul separate gangs of mechanics, versed in their individual peculiarities.



Standardization in Factory Buildings

Industrial Plants Built According to Standardized Plans, with a Structural Steel Framework Fabricated in Advance, Can Be Erected Rapidly and at Low Cost

RECENT achievements in rapid plant construction have called attention to the great progress that has been made in standardized industrial buildings. With the appreciation that standard construction has met with in the automobile industry, there is little wonder that the eyes of the automobile world have been attracted by the merits and economy of this method of building construction. The case is exactly parallel to that of any other industrial product. Wherever a purchaser has to order a product especially designed and built for him, it naturally requires a long time for delivery, is much more expensive, and oftentimes not as satisfactory as a standard product. This, of course, is keenly realized by automobile and automobile parts manufacturers, and in the same manner it can readily be seen that standardization might equally well be applied to the building industry.

When a man builds his home he wishes it to possess beauty as well as utility. The building of real homes will never be standardized. When a man wishes to have a factory built he thinks of utility, permanence and economy far more than he thinks of beauty. It is a place for production. It is susceptible of standardization both in design and construction.

The Austin Co. of Cleveland has put this standardized building idea on a practical basis and has put up standardized buildings for a number of concerns in the automobile industry, such as the Packard Motor Car Co., Nordyke & Marmon Co., Peerless Motor Car Co., King Trailer Co., Jackson Rim Co., Jackson Wheel Co., Mott Wheel Co. and a number of others. These buildings are standardized as to design, construction and cross-section dimensions, but vary as to length. Each building requires the minimum of material for good construction, and, consequently, can be built in the shortest time at moderate cost.

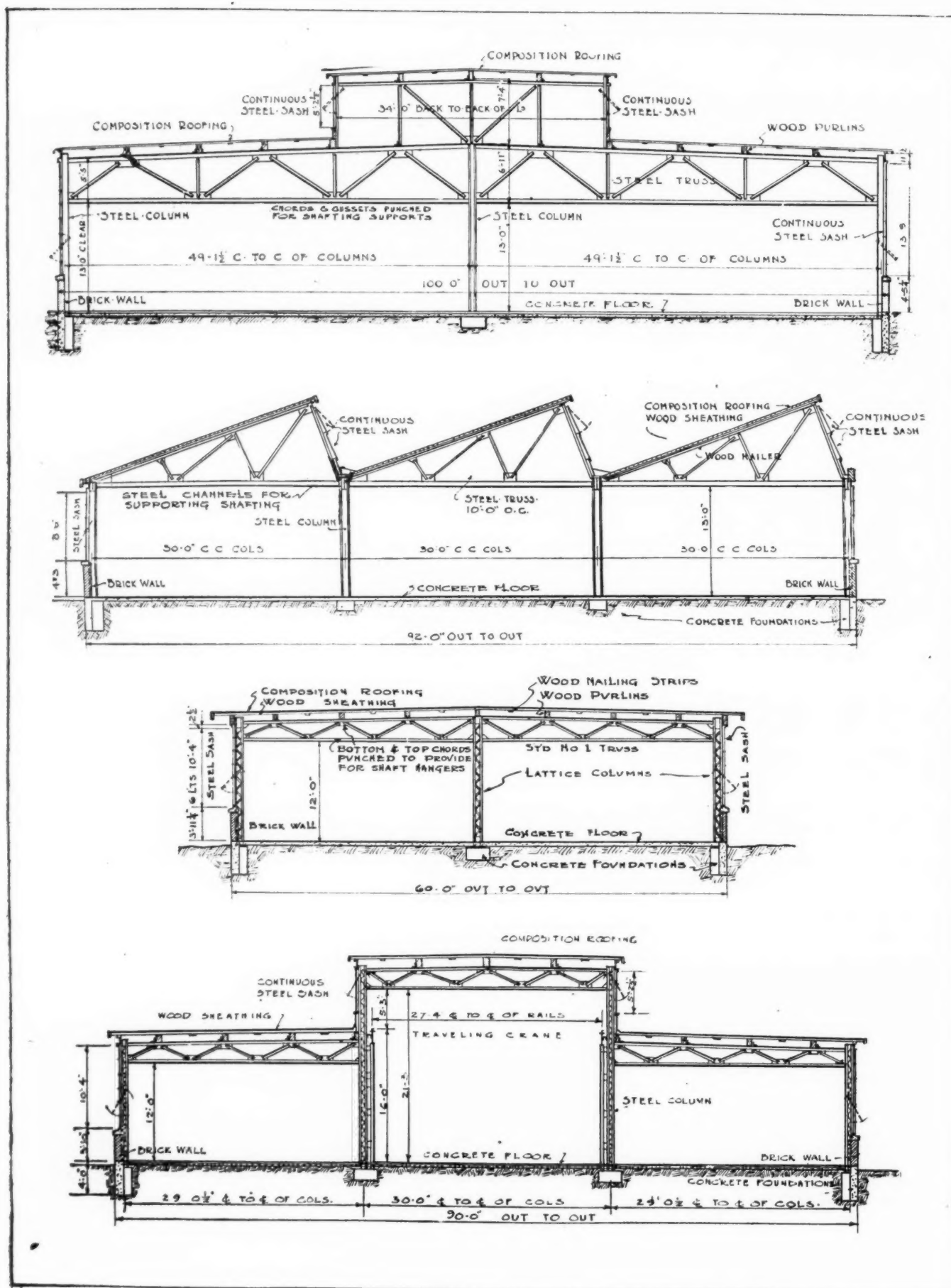
Advantages of Standardized Construction

The great value of standardized construction service is made possible by several newly recognized means to efficiency: The application of the best engineering talent to the given design; doing away with the necessity of working out details in each instance; purchasing materials at that geographic point where the market quotations may be lowest; carrying in stock, ready for immediate shipment, structural steel and practically all other requisite materials; speeding up of freight shipments; pushing all phases of construction simultaneously; sending out dependable erection forces trained to the standard method.

One of the basic ideas of the standardized building proposition is that if factory buildings can be erected in one-half or one-third of the usually required time, this means that the manufacturer gains weeks or months in production profits. If buildings can be put up in any multiple of a given length (say 20 ft.) this means that

Facade (left) and interior (below) of the Hudson - Stuyvesant Motor Co.'s building





Cross-sections of four types of single-story buildings

they are flexible units and that the owner may, at any time, by a re-employment of the standard design, add to or alter his commercial establishment in any way.

About thirty out of 300 of these structures, or 10 per cent, have been erected by the Austin Co. for firms in the automobile industry. The Austin Co. has found that by nine types of standard factory buildings they can cover the essential requirements of stabilized industries. Seven of these are one-story types; the minimum width is 60 ft.; each type is variable in length. Three types are completed under penalty in thirty working days after order, and four types in sixty working days. The time limit for the two multi-story models depends on size and conditions; but these also are short-time types.

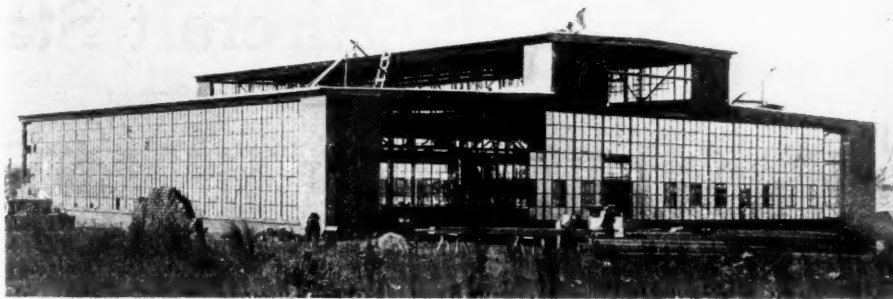
The nine types of Austin standard factory buildings include three types that can be completed ready for occupancy in thirty working days after the order is placed; four sixty-day types and two multi-story types that require somewhat more time. This remarkably quick construction is possible only because much of the work is done before the order is received. Plans are standardized and ready. Specifications are prepared and basic costs figured. Structural steel is ready-fabricated. Other materials are in stock or easily procurable in the standard sizes used. In short, these buildings are shop-manufactured in advance of the order for quick assembly on the owner's land. And they are in no sense portable or temporary buildings, but substantial structures for permanent service.

Careful analysis of large industrial plants indicates that no matter how highly specialized certain portions of these plants may be, there is a striking similarity in 30 per cent to 40 per cent of the floor space.

When general business is active, building is active—to the point where, in conformity to the law of supply and demand, advancing costs reach a prohibitive figure, then the pendulum swings backward. A chart of building activities for a period of 5 years shows an alternation of high peaks and deep depressions. How can the curve be equalized? By buying materials when prices are low, and carrying them in stock for future use—and this can be done only when buildings are standardized. This points to the desirability of standardization in building.



Showroom in Hudson-Stuyvesant Motor Co.'s building



Anderson Tire Co.'s Plant

The floor area may be varied at will. Standards may be any desired length in multiples of the bay, and further variations may be attained by the suggested combinations.

Under the old method of treating every building as a highly individual project, the owner, when he decides to build, communicates his requirements to an industrial engineer. The engineer studies the requirements, designs the building and submits the plans. The owner calls for certain changes, which are made. Two or more builders are then asked to submit estimates, and time is taken to get the bids in, compare them, and decide who shall have the job. At last the contract is let. Eight or 10 weeks have gone before a hand is turned in actual construction. In this time any of the one-story standard factory buildings could have been completed. But the builder under the old method is just beginning. He must order his material at current prices, have structural steel fabricated, perhaps have sash and doors made to order, and lumber cut to waste, to meet the individual plans.

It is possible for a company making these standardized buildings, knowing in advance what materials they require, to buy in quantities at advantageous prices. For instance, when there is a lull in the structural market, the steel companies are able to turn out these standardized fabricated structures at a low price, and this saving can readily be taken advantage of by those putting up factory buildings. A brief summary of the standard types may be of interest:

List of Standard Types

No. 1 is a building for storage or light manufacturing, requiring 30 working days for its completion. It has a width of 60 ft. and the length may be any multiple of 20 ft. The roof trusses or beams have ample strength for supporting shafting, and are set horizontal for that purpose. The beams are also strong enough to carry a monorail for loads up to 1000 lb.

No. 2 requires 30 working days, is 90 ft. wide, with three 30-ft. aisles of the trussed construction. The lengths are in multiples of 20 ft. Auxiliary columns may be provided to carry a traveling crane. This standard building may be extended sideways to include any desirable number of aisles, or can be used as an upper story to Austin standards No. 8 and No. 9.

No. 3 is the most commonly used type. The building is 100 ft. wide, which is the most economical maximum that can be well lighted through side walls and one monitor. It is amply ventilated and has broad areas of unobstructed floor space. As there is only one column to every 2000 sq. ft., the length may be as desired, in multiples of 20 ft., and the building is susceptible of various combinations. The other standards carry the idea further along.

No. 4 is a saw-tooth building which can be furnished
(Continued on page 435.)

S. A. E. Aircraft Standards

Third Installment

Aeroplane Engine Testing

S. A. E. Recommended Aeronautic Practice

The following test specifications are divided into two classes, one a Routine Factory Test and the other a Type Test.

Routine Factory Tests for Fixed Engines (Low or Normal Compression)

Test No. 1

Engines may be run in by such methods as are found most satisfactory for each type of engine, but must not be run under own power over ten hours before the first official test.

Test No. 2

For engines with compression ratio 5 and below.

Engine will be mounted on a torque stand or stationary stand and fitted with club or propeller, properly calibrated for rated load at rated speed. Engine will be fitted with all the accessories that are to be supplied by the engine manufacturer. If started by hand, it must in every attempt be started within five minutes by one man.

Test will consist of: Four hours continuous running at

rated power and rated speed. All readings required shall be recorded on S. A. E. standard log sheet every ten minutes.

(a) The test must be continuous and in case of a stop occurring during the first hour, the run will be repeated.

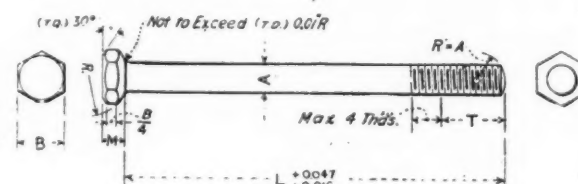
(b) In case of a stop occurring after the first hour and not due to a fault of the engine, the run will be continued, but the inspector may require an extension of the running time equal to twice the time lost.

When a stop occurs at any time due to a fault of the engine, the inspector may require the complete run to be repeated.

(c) No manipulation of the engine, while running, will be allowed, except such as can be made by a pilot from his

Ball Hexagon-Head Bolts

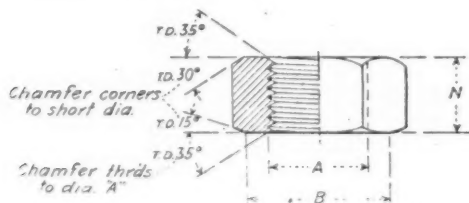
S. A. E. Recommended Aeronautic Practice



Plain Hexagon Nuts

(For Bodies and Wings, Not Engines)

S. A. E. Recommended Aeronautic Practice



A Size	Threads per In.	B Hex. Short Dia.	N
*0.112 (No. 4)	To be determined	0.250 (1/4)	0.094 (3/32)
*0.138 (No. 6)		0.312 (5/16)	0.109 (7/64)
0.164 (No. 8)	32	0.375 (3/8)	0.125 (1/8)
0.190 (No. 10)	32	0.375 (3/8)	0.141 (9/64)
0.216 (No. 12)	32	0.438 (7/16)	0.156 (5/32)
0.2500 (1/4)	28	0.438 (7/16)	0.187 (3/16)
0.3125 (5/16)	24	0.500 (1/2)	0.234 (15/64)
0.3750 (3/8)	24	0.563 (9/16)	0.281 (9/32)
0.4375 (7/16)	20	0.688 (11/16)	0.328 (21/64)
0.5000 (1/2)	20	0.750 (3/4)	0.375 (3/8)
0.5625 (9/16)	18	0.875 (7/8)	0.422 (27/64)
0.6250 (5/8)	18	0.938 (15/16)	0.469 (15/32)

A = Size of Bolt.
All Threads U. S. Form.

T. D. = Tooling Dimensions.
Dimensions in Inches.

Bolts, Size A, Threads per Inch	*Limits A	B	M	R
.164 (No. 8)—32	0.164 0.160	.3125 (5/16)	.172 (11/64)	.375 (3/8)
.190 (No. 10)—32	0.190 0.186	.3750 (3/8)	.172 (11/64)	.375 (3/8)
.216 (No. 12)—32	0.216 0.212	.3750 (3/8)	.172 (11/64)	.375 (3/8)
.2500 (1/4)—28	0.250 0.246	.4375 (7/16)	.203 (13/64)	.375 (3/8)
.3125 (5/16)—24	0.313 0.309	.5000 (1/2)	.250 (1/4)	.375 (3/8)
.3750 (3/8)—24	0.375 0.371	.5625 (9/16)	.313 (5/16)	.500 (1/2)
.4375 (7/16)—20	0.438 0.434	.6875 (11/16)	.359 (23/64)	.500 (1/2)
.5000 (1/2)—20	0.500 0.496	.7500 (3/4)	.375 (3/8)	.500 (1/2)
.5625 (9/16)—18	0.563 0.558	.8750 (7/8)	.469 (15/32)	.625 (5/8)
.6250 (5/8)—18	0.625 0.620	.9375 (15/16)	.516 (33/64)	.625 (5/8)

When body length L = 1/2" 5/8" 3/4" 7/8" 1" Over 1"
Length of thread T = 3/8" 7/16" 1/2" 5/8" 3/4"

All threads U. S. Form. Dimensions in Inches.
*Finished size including plating or rust preventing treatment when used. Bureau of Standards recommend .001 in. as thickness of plating for rust prevention.

seat. Replenishing of gasoline and oil supplies and regulating of the cooling water temperature is allowable.

Engine will be disassembled, inspected and if all parts are accepted, it will be re-assembled. If in the opinion of the inspector, parts must be replaced, he may require the whole or portion of the run to be repeated.

Test No. 3

Engine with all the accessories that are to be supplied by the manufacturer will be mounted on a torque stand and

Bevel Washers

S. A. E. Recommended Aeronautic Practice

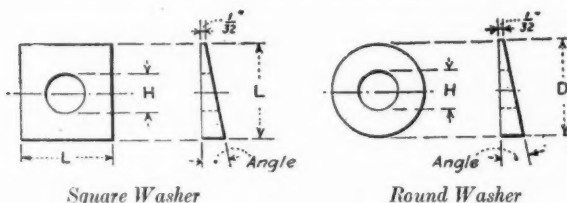


TABLE OF SQUARE AND ROUND BEVEL WASHERS

Angle Values, 6, 12, 24, 36 Degrees for All Sizes

Bolt Size	H	D	L
No. 4 (.112)	No. 31 (.120)	3/8	3/8
No. 6 (.138)	No. 26 (.147)	7/16	7/16
No. 8 (.164)	No. 17 (.173)	1 1/32	1 1/32
No. 10 (.190)	No. 8 (.199)	1/2	1 1/32
No. 12 (.216)	No. 1 (.228)	9/16	1 1/32
1/4	17/64	5/8	1 1/32
5/16	21/64	1 1/16	2 1/32
3/8	25/64	3/4	2 1/32
1/2	29/64	15/16	7/8
	33/64	1	7/8

Note.—Both sides must be flat and free from burrs. If the washers can be cut by shearing and without distorting the surface, this is permissible. Stock must be bright medium carbon steel.

BALL HEXAGON NUTS

S. A. E. Recommended Aeronautic Practice

Size A and Threads per Inch	BALL HEXAGON			BALL CASTLE			
	B	N	R	B	N ¹	S	O
.164 (No. 8)—32	.375 (3/8)	.172 (1 1/64)	.375 (3/8)	.375 (3/8)	.250 (1/4)	.078 (3/64)	.078 (3/64)
.190 (No. 10)—32	.375 (3/8)	.172 (1 1/64)	.375 (3/8)	.375 (3/8)	.250 (1/4)	.078 (3/64)	.078 (3/64)
.216 (No. 12)—32	.438 (7/16)	.172 (1 1/64)	.375 (3/8)	.438 (7/16)	.266 (1 1/64)	.078 (3/64)	.094 (3/32)
.2500 (1/4")—28	.438 (7/16)	.203 (13/64)	.375 (3/8)	.438 (7/16)	.297 (1 1/64)	.078 (3/64)	.094 (3/32)
.3125 (5/16")—24	.500 (1/2)	.250 (1/4)	.375 (3/8)	.500 (1/2)	.344 (1 1/32)	.078 (3/64)	.094 (3/32)
.3750 (3/8")—24	.563 (9/16)	.313 (5/16)	.500 (1/2)	.563 (9/16)	.438 (7/16)	.125 (1/8)	.125 (1/8)
.4375 (7/16")—20	.686 (1 1/16)	.359 (23/64)	.500 (1/2)	.688 (1 1/16)	.484 (31/64)	.125 (1/8)	.125 (1/8)
.5000 (1/2")—20	.750 (3/4)	.375 (3/8)	.500 (1/2)	.750 (3/4)	.563 (9/16)	.125 (1/8)	.188 (3/16)
.5625 (9/16")—18	.875 (7/8)	.469 (3 1/32)	.625 (5/8)	.875 (7/8)	.656 (21/32)	.156 (5/32)	.188 (3/16)
.6250 (5/8")—18	.938 (15/16)	.516 (33/64)	.625 (5/8)	.938 (15/16)	.766 (49/64)	.156 (5/32)	.250 (1/4)

fitted with a club or propeller, properly calibrated. It will be given a continuous run of one hour at not less than rated power and rated speed. All readings required will be recorded on S. A. E. standard log sheet every ten minutes.

After this test the engine shall be cleaned and inspected and put into condition for shipment. If satisfactory, the engine shall be stamped by the inspector.

Note.—If desired, the horsepower may be corrected for air temperature and barometric pressure. In such cases the power will be corrected to a surrounding air temperature of 59 deg. F. (15 deg. C.) and normal sea level pressure which is 29.92 (760 mm.) of mercury at 32 deg. F. (0 deg. C.) and at 45 deg. latitude.

In case of question the corrected power shall govern.

(High Compression)

Test No. 2A

For engines with compression ratio exceeding 5:

Engine will be prepared as under Test No. 1 and No. 2.

This test will consist of four hours continuous running at 8/10 rated load and rated speed. Otherwise, this test will be the same as No. 2 and the same rules will apply.

Disassembly and inspection will be the same as in Tests No. 2 and No. 3.

Test No. 3A

This test will be the same as No. 3, but at 8/10 rated load and at rated speed.

After this test, the engine will be inspected and accepted as in Routine Test No. 3.

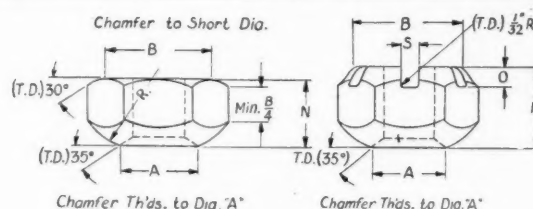
Type Tests for Fixed Engines

(Low or Normal Compression)

The first engine of a type and one out of each hundred in production will be given the following test:

Selection of this engine shall be made by the inspector without previous notice to the manufacturer.

The engine must not run under its own power over 10 hours before the first official test and must be taken from regular production. (See No. 1 Routine Test.)



Test No. 4

For engines with compression ratio of 5 and below.

The engine is to be mounted and equipped as in Test No. 2 of Routine Tests and fitted with a club or propeller properly calibrated.

Total running time shall be 50 hours, divided as follows:

Five hours at 9/10 rated power and at rated speed.

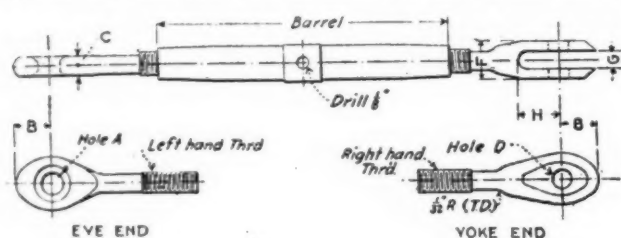
Not over one hour stop with minor adjustments allowed.

Five hours at 9/10 rated power and at rated speed.

Not over 13 hours stop during which engine may be disassembled, overhauled, carbon removed, valves ground and adjusted, magnetos and spark plugs cleaned and adjusted. No adjustment or replacement of major parts is allowed. Any multiple part, such as a valve, may be replaced when replacement is made necessary through defective material. In no case, however, shall more than one such part be replaced during the entire 50 hours.

Turnbuckles for Aircraft

The dimensions given are for short and long turnbuckles, each length having either two eye-ends or one eye-end and one yoke-end.



Nos.	Strength in Pounds	EYE ENDS, INCHES			YOKE ENDS, INCHES				
		A	B	C	D	E	F	G	H
1	500	3/32	3/32	1/4	3/16	3/32	3/16	3/4	3/8
2	1,000	3/32	3/32	1/4	3/16	3/32	3/16	3/4	3/8
3	1,500	3/16	1/32	3/16	3/16	1/32	1/4	3/4	3/8
4	2,000	13/64	1/32	3/16	3/16	1/32	5/16	3/4	3/16
5	2,500	19/64	1/32	3/16	1/4	13/32	1/32	3/4	3/16
6	3,000	19/64	1/32	3/16	1/4	13/32	1/32	3/4	1/2
7	3,500	19/64	3/16	1/4	1/4	3/16	3/16	13/16	1/2
8	4,000	19/64	3/16	1/4	3/16	3/16	3/16	13/16	3/16
9	4,500	21/64	3/16	3/16	3/16	3/16	1/2	13/16	3/16
10	5,000	21/64	1/32	3/16	3/16	13/32	3/16	17/16	3/16
11	6,000	23/64	1/32	3/16	3/16	13/32	3/16	17/16	3/16
12	7,000	23/64	1/32	3/16	3/16	13/32	3/8	17/16	3/8
13	8,000	23/64	1/2	1/32	3/16	3/8	3/8	21/16	11/16
14	9,000	23/64	1/2	1/32	3/8	3/8	11/16	21/16	11/16
15	10,000	23/64	3/16	3/8	3/8	3/16	11/16	21/16	11/16

Type of turnbuckle	Short	Long
Length of barrel	2 in.	4 in.
Made in numbers	1 to 7 incl.	1 to 15 incl.
Length between centers of eyes with:		
Threads flush with ends of barrel	4 in.	8 in.
Ends extended a maximum	4 3/16	8 3/16
Ends extended a minimum	3 3/4	5 1/2

With two eye ends, thread one left hand and the other right hand.
With one eye end and one yoke end, thread eye end left hand.

Five hours at 9/10 rated power and at rated speed.

Not over one hour stop with minor adjustments allowed.

Five hours at 9/10 rated power and at rated speed.

Not over 13 hours stop and same work allowed as before.

Five hours at 9/10 rated power and at rated speed.

Not over one hour stop with minor adjustments allowed.

Five hours at rated speed and at rated power.

Not over 13 hours stop and same work allowed.

Five hours at rated power and at rated speed.

Not over one hour stop with minor adjustments.

Five hours at rated power and at rated speed.

Not over 13 hours stop and same work allowed.

Ten hours at rated power and at rated speed.

Rule (c) under Routine Test 2 will apply to each run.

In case of a forced stop during any of above runs, rules (a) and (b) under Routine Test No. 2 will apply.

If the stop is due to a failure of any multiple part such as a valve, the part may be replaced, providing such failure is due to defective material and a similar part has not previously been replaced since the 50-hour test was started.

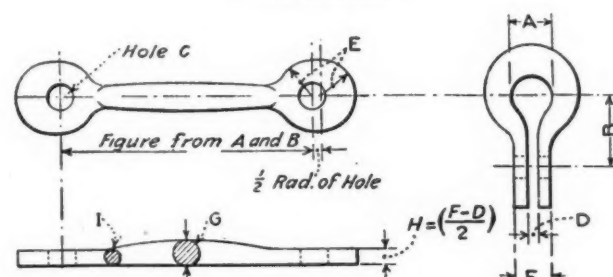
During complete run all required readings must be recorded on S. A. E. standard log sheet every 10 minutes. The mean power (see note under Routine Test No. 3) must not fall below the rated power; and gasoline and oil consumption must not exceed the predetermined maximum.

After the test is completed, the engine is to be disassembled and, if acceptable to the inspector, may be reassembled after replacing any parts which the inspector may designate.

Test No. 5

Engine is to be mounted in a fuselage or tilting stand and fitted with propeller. With the axis of the engine making 15 deg. with horizontal, it is to run at full power full speed for 15 minutes. Then without altering speed or any part, or adjustment, the axis is to be brought again

Shackles



Turnbuckle No.	Shackle Strength, Lb.	D*	C	E	A	B	G	I	F
1	500	3/16	3/16	1/4	1/4	3/16	3/16	3/32	3/16
2	1000	3/16	3/16	1/4	1/4	3/16	3/16	3/32	3/16
3	1500	3/16	3/16	1/4	1/4	3/16	3/16	3/32	3/16
4	2000	3/16	3/16	1/4	1/4	3/16	3/16	3/32	3/16
5	2500	3/16	1/4	5/16	5/16	3/8	1/4	3/16	13/32
6	3000	3/16	1/4	5/16	5/16	3/8	1/4	3/16	13/32
7	3500	13/64	1/4	5/16	5/16	3/8	1/4	3/16	3/16
8	4000	13/64	3/32	11/32	3/8	11/16	3/8	3/32	3/16
9	4500	13/64	3/32	11/32	3/8	11/16	3/8	3/32	3/8
10	5000	17/64	3/32	11/32	3/8	11/16	3/8	3/32	3/8
11	6000	17/64	3/16	3/8	3/16	3/4	3/16	3/16	3/8
12	7000	17/64	3/16	3/8	3/16	3/4	3/16	3/16	3/8
13	8000	21/64	3/16	3/8	3/16	3/4	3/16	3/16	3/8

Dimensions in inches. *Opening for clip lug.

horizontal and then tilted to 15 deg. in the opposite direction and run 15 minutes.

If this test is satisfactory, the engine will be put through Routine Test No. 3 except that the running time shall be 30 minutes instead of one hour. After this test, the engine will be inspected and accepted as in Routine Test No. 3.

(High Compression)

The same rules apply regarding preparation and selection as for Test No. 4.

Test No. 4A

For engines with compression ratio exceeding 5.

This test will be the same as test No. 4, but the first five runs shall be made at 7/10 rated load and at rated speed. The next four runs will be made at 8/10 rated load and at rated speed.

Disassembly and inspection will be the same as in Tests No. 4 and No. 5.

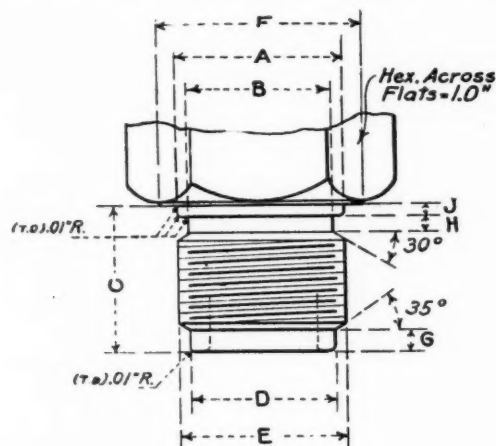
Test 5A

Engine will be put through a test the same as No. 5, but at 8/10 rated load and at rated speed.

If the engine passes Test 5A it will be put through Routine Test No. 3A except that the running time will be 30 minutes instead of one hour. This engine will then be inspected and accepted as in Routine Test No. 3.

Spark-Plug Shell Dimensions

S. A. E. Recommended Aeronautic Practice



Thread: 18 mm. 1½ mm. pitch.

Form of thread: International standard (same as U. S. standard only ½ as much truncation at root of thread).

SPARK-PLUG SHELL DIMENSIONS

Dimension	MAXIMUM		MINIMUM	
	Mm.	Inches	Mm.	Inches
A.....	18.03	0.710	17.93	0.706
B.....	16.87	0.664	15.87	0.625
C.....	15.87	0.625 (¾)	15.87	0.625 (¾)
D.....	15.87	0.625		
E.....	17.97	0.708	17.85	0.703
F.....			23.83	0.938 (1½/16)
G.....			2.38	0.094 (¾/32)
H.....	1.98	0.078 (¾/16)		
J.....	1.19	0.047 (¾/16)		

TAPPED HOLE DIMENSIONS

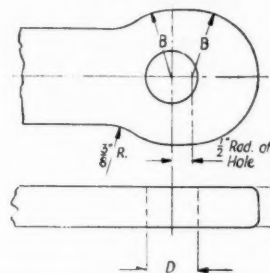
Diameter	MAXIMUM		MINIMUM	
	Mm.	Inches	Mm.	Inches
Outside....	18.325	0.72146 (0.721)	18.187	0.71603 (0.716)
Pitch.....	17.176	0.67622 (0.676)	17.051	0.67124 (0.671)
Root.....	16.201	0.63783 (0.638)	16.076	0.63291 (0.633)

Note.—The limits for spark-plug threads as shown in the following table have been reported as adopted by the (British) Engineering Standards Committee.
The standard thread for spark-plug terminal is No. 8-32 (0.164 dia.), A. S. M. E. standard.

SPARK PLUG THREAD DIMENSIONS

Diameter	MAXIMUM		MINIMUM	
	Mm.	Inches	Mm.	Inches
Outside....	17.975	0.70768 (0.708)	17.850	0.70275 (0.703)
Pitch.....	17.001	0.66933 (0.669)	16.876	0.66441 (0.664)
Root.....	15.864	0.62457 (0.625)	15.739	0.61964 (0.620)

Clip Ends



Clip and Turnbuckle Number	Strength, Lb.	B	C	D
1	500	¼	⅛	⅜
2	1,000	¼	⅛	⅜
3	1,500	¼	⅛	⅜
4	2,000	⅜	⅜	⅜
5	2,500	⅜	⅜	¼
6	3,000	¾	⅜	¼
7	3,500	¾	⅜	¼
8	4,000	¾	⅜	⅜
9	4,500	¾	⅜	⅜
10	5,000	¾	¼	⅜
11	6,000	¾	¼	⅜
12	7,000	¾	¼	⅜
13	8,000	¾	⅜	⅜
14	9,000	¾	⅜	¾
15	10,000	¾	⅜	¾

The width of the arm is determined according to the strength of the material. Dimensions in inches.



The F O R U M



Recommendations for Focusing Automobile Headlamps

G. L. Sealey*

WHEN automobile headlamps are properly focused, the center of the filament of the incandescent lamp coincides with the focal point of the reflector. When this condition is attained, the resultant beam is concentrated, dark spots are eliminated, objectionable stray light is diminished and the greatest amount of useful light is obtained. The sketch, Fig. 1, shows simply how the light is distributed by a parabolic reflector for three positions of a point light source. A', A', are parallel beams distributed when the point source is at the focus, while B', B', and C', C', are the beams distributed when the point source is, respectively, back of and in front of the focus. Although the filament of an incandescent lamp is not exactly a point source, and without going further into the theory of the parabolic reflector, it may be said that the concentrated filament of a mazda C lamp acts in the same general way as a theoretical point source. When the incandescent lamp is at the focus of a parabolic reflector, a beam of small diameter is directed forward which, when intercepted perpendicularly by a large card or paper, will give a light spot as shown by the photograph of Fig. 2. When the incandescent lamp is in front of or back of the focus, the light spot on the card will resemble that of Fig. 3.

An ideal location for focusing headlamps is a straight roadway having at least 75 ft. between the car and the side of a garage, or other surface vertical to the road, on which is drawn a line or mark 42 in. above the road level. When such a spot is found, the car should be placed so as to have the headlamps facing the side of the garage and projecting the light upon it. The relative position of the filament and focal point of the reflector should then be changed by moving the incandescent lamp (by means of the socket adjustment) forward or backward until the light spot of smallest diameter, or greatest concentration, is secured, as shown in Fig. 2. This operation should be performed on one headlamp at a

*Engineering Department, National Lamp Works of General Electric Company.

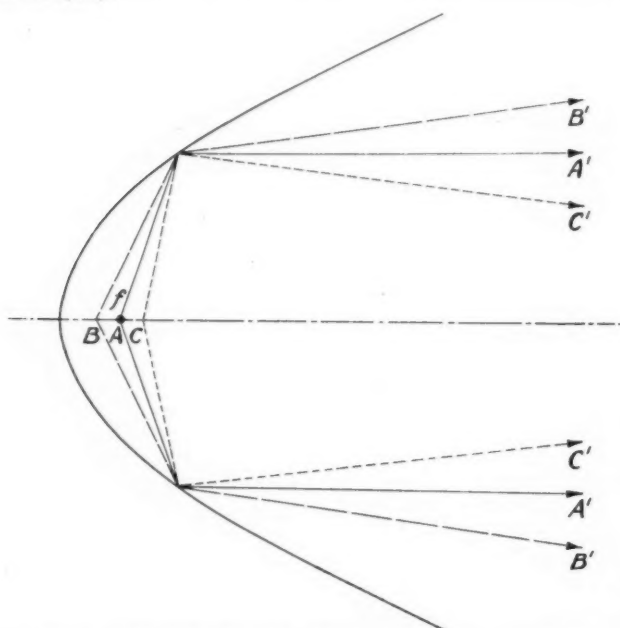
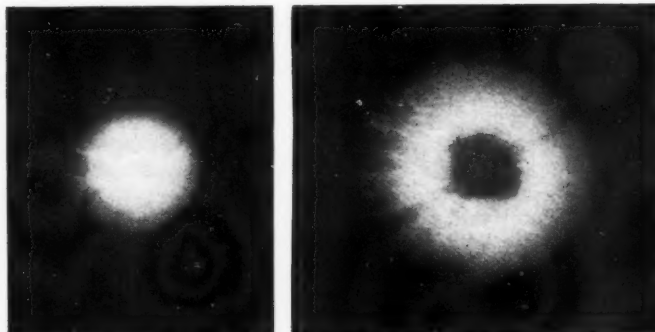


Fig. 1—Sketch showing the action of a parabolic reflector



Figs. 2 and 3—Spots appearing on card when lamp bulb is in focus and when it is either forward or back of the focus respectively

time so as to be certain that each headlamp is correctly focused.

Four Types of Focusing Devices

The four principal types of automobile headlamp focusing devices, or socket adjustments, are: (1) rim, (2) external, (3) bulb, (4) rear. In the rim type of adjustment the incandescent lamp is moved forward or backward by turning a screw placed on the rim of the reflector, and in the external type of adjustment this adjusting screw is placed to the rear of the lamp housing. In the bulb type, adjustment is accomplished by twisting or turning the incandescent lamp bulb. It is necessary to remove the reflector from the headlamp, and to loosen a screw or other means of holding the lamp in position at the rear of the reflector before adjustment can be made with the rear type. The latter two devices are not considered satisfactory since they necessitate the direct handling of the incandescent lamp or the dismantling of the headlamp in order to secure the desired result.

When the filament has been brought to the proper position with reference to the focal point of the reflector, that is, when the lamp has been properly focused, the height of the main beam of light above the level of the roadway should be carefully observed. Most state laws require that at 75 ft. in front of the car the main beam of light shall rise not more than 42 in. above the level of the roadway under any condition of loading. By carefully observing the line, or mark, on the side of the garage and the beam of light obtained from the headlamps this law may be complied with. It is often necessary to tilt the headlamps slightly by bending the supports in order to accomplish the desired result.

Rules for Focusing

While the main point is that the direct light should be kept below the 42-in. line, it is also well to remember that the beams from the two headlamps should be so projected that they do not spread the light mainly to the side of the road instead of directly ahead. When the headlamps have been adjusted so that the lamps are properly focused and the light does not rise above the 42-in. line, the location of the beams from the two lamps with respect to one another should be considered. To have the road properly illuminated the two circles of light should slightly overlap one another at 75 ft. In other words, the most desirable illumination is obtained when, with the proper consideration of the other points just mentioned, the two beams slightly overlap rather than widely diverge. If the two beams are divergent they may be brought into correct relation by bending the supporting forks for the headlamps or by adjusting the rod connecting the two.

With the increasing agitation for laws to eliminate glare and an increasing attempt on the part of automobile drivers

to be more courteous on the road, it is necessary that headlamps be correctly focused. It has been found that the great majority of automobile drivers are not fully acquainted with the method for properly focusing their headlamps. Since this condition exists, it is suggested that a straight stretch of roadway, with a garage, barn, or other vertical surface on which a 42-in. line may be marked, be found, and this place called to the attention of automobile drivers in each locality so that when in doubt they may drive up to this particular location and carefully measure the height to which the top of the beam rises. This will result in better compliance with existing laws. A little attention given by automobile drivers to the above points may prevent unpleasant situations with officers of the law.

Straight Cut Refinery Products

By George M. Holley

MR. HASTINGS has called to my attention a quotation from a paper by Dr. E. W. Dean, as follows:

"The Bureau of Mines has had called to its attention many devices for the utilization of kerosene, but believes that mechanical development in this particular line is a mistake. The logical and reasonable way to utilize kerosene is not as such, but as a mixture with the gasoline produced with it in the refining of crude oil. In other words, attention should not be given to the utilization of petroleum distillates containing both the gasoline and kerosene fractions of crude oil."

I am taking it for granted that the word "not" in the

above paragraph is a typographical error, and should have been omitted, as, with this word in, the whole paragraph disputes itself.

This quotation is one of the most far-seeing statements I have read in several months. We have had here at the factory for several months straight cut fuels from refineries containing practically all of the gasoline and all of the kerosene which can be obtained from a barrel of crude, and it is self-evident to us that in the long run straight cut fuels will be used in preference to what is called either gasoline or kerosene at the present day, in other words, all of the fuels with a boiling point below 550 deg. In the particular field from which we obtained our straight cut fuel, this multiplied the yield from a barrel of crude by three. The straight cut fuel would cost only a trifle more. In the winter time it is a little harder to start, and, unless the vaporizing apparatus is very efficient, it does not drive away as well as ordinary gasoline.

We, however, take exception to Dr. Dean's statement that it is a mistake to develop devices for the utilization of kerosene, simply because a carbureter which will efficiently use kerosene oil will handle any other fuel that much more efficiently. A perfected kerosene carbureter is a highly perfected gasoline carbureter, and will give very much better satisfaction on ordinary gasoline. A highly developed kerosene carbureter will use ordinary gasoline in zero weather, just the same as the old type carbureters use gasoline in summer weather. In other words, atmospheric temperature does not affect carburetion.

The more you can drive home the straight cut fuel proposition, the larger the available fuel supply will be.

Exhaust Muffler Based on Gun Silencer Principle

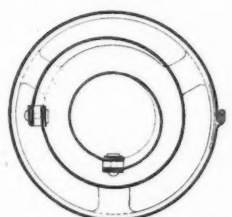
EVER since Hiram Percy Maxim invented the gun silencer he has been manufacturing on a small scale an explosion engine muffler based on the same principle. Recently Geuder, Paeschke & Frey, the well-known Milwaukee firm specializing in deep drawings of metal, has secured a license under the Maxim patent, and as it has very extensive works the prospects are that the Maxim muffler will be turned out hereafter in large numbers. A sectional view of this device is shown herewith. The exhaust products enter the central chamber at one end and thence pass into an annular chamber surrounding the central chamber, not through a multitude of holes as is customary, but through a slot $\frac{3}{16}$ in. wide extending the entire length of the muffler. From the intermediate chamber the gas passes to the outer chamber in the same way—through a $\frac{3}{16}$ -in. slot the entire length of the muffler, but the direction of motion is the reverse this time. From the outer chamber, where, of course, the hot gases are subjected to a strong cooling action, they pass through three large punched holes in the inner header into a chamber at the end of the muffler and thence through the central discharge pipe to the atmosphere.

Mr. Maxim contends that in the discharge of the spent gases from the engine cylinders there are two distinct noises. The first, known as the primary noise, is caused by the high pressure gases issuing from under the suddenly lifted exhaust valve. This may be called the pressure noise, because it is due to the high pressure of the gases when the exhaust valve liberates them and to distinguish it from the other noise, the gas puff noise, which is produced as the gas issues from the exhaust pipe into the muffler device. This latter might be called the quantity noise.

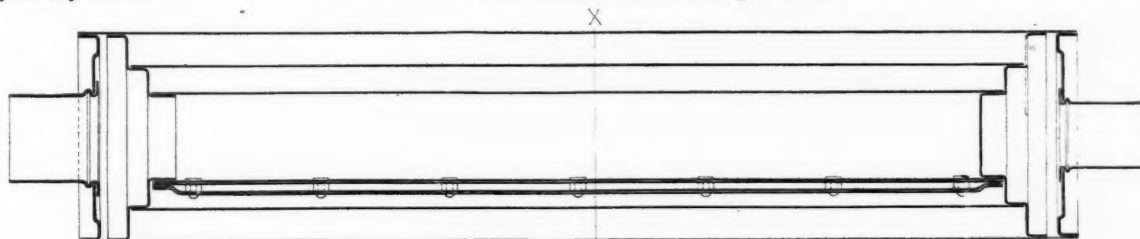
Referring to the cross-sectional sketch of the Maxim muffler herewith, the way in which the pressure noise is prevented is easily explained. This noise consists of a wave which originates at the exhaust valve when the latter suddenly opens, the wave traveling through the exhaust pipe and into the inner tube of the silencer. It passes out of the latter through the tangential slot. Part of the wave passes one way and part the other way, because a noise wave, unlike a column of advancing gas, has no inertia. The splitting up of the wave continues at the outlet of the intermediate tube. Each time either one of the two waves coming through the inner tube leaves it, part of the wave is broken up, and these separate parts start traveling in both directions around the central tube. The original wave is thereby split up into a great number of smaller waves and is thus rendered quiet.

To overcome the quantity noise it is the general custom to obstruct the path of the gases in one way or another. Sometimes perforated baffle plates are placed inside the muffler, or again perforated concentric tubes are used. In the Maxim muffler the kinetic energy of the gas is dissipated in an entirely different manner. Instead of obstructing the escape of the gas, the latter is allowed to issue from the central tube through a tangential slot into the next tube. This causes a whirling of the gas, fresh incoming gas constantly being added to the whirl. No obstruction is placed in the path of the gases, the energy being dissipated by the cooling effect and by friction against the walls.

The outer cylinder of the muffler is lock-seamed and spot-welded right through the four thicknesses of metal, and the headers are spot-welded to the tubes. A muffler 24 in. long and 5 in. in diameter weighs 8 lb.



SECTION THROUGH X-Y



Transverse and longitudinal sections of the muffler of the Maxim silencer

Body Details At the Salon and the Palace

Tendency Toward Lower Construction and a More Pleasing Appearance—
Greater Comfort Also an Object

By George J. Mercer

THE two chief aims in body design are to keep the body low and light looking, and parts of the car that are separate from the body proper, but have a contributory effect, including the guards, the engine hood and radiator, the runboards, the gasoline tank, the lamps and the wheels, have all been altered with the above-mentioned ends in view.

Wheels are smaller, the wire wheels, especially, being 2 to 4 in. less in diameter than formerly; the runboards now average 15 and 16 in. from the ground to the top, a gain of 2 and 3 in.; the mud splasher, as shown in Fig. 1, helps in the same relation, and the long front guard meeting the runboard back at the dash line, as illustrated in Fig. 2, is a considerable help. The engine hoods are higher, necessitating a higher radiator, and permitting a higher cowl. The long, narrow louvres, as illustrated in this same view, give a distinctiveness not obtained in the older form.

The elimination of the lamp on the dash by the provision of dimmers on the headlight has been a decided improvement. Fig. 1 shows two ways of supporting the headlights. At the left the bracket is mounted on the frame, while at the right it is attached to the guard. The latter is very much the best arrangement; it looks cleaner, and as a tie rod is used in both cases, there can

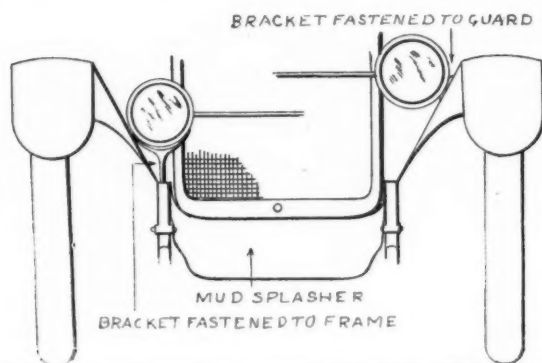


Fig. 1—Lamp support and splash guard

be no question as to the durability of the bracket on the guard. The diameter of the headlight front is important from the standpoint of appearance. On some cars this was 7 in., which looks insufficient. On others it was 10 in. and 12 in., which is better. Also, it is a mistake to have the metal rim black; if the rim is nickel the size of the glass appears to be increased.

Placing the gasoline tank at the rear was the first step toward lowering the bodies. Taking it from under the driver's seat permitted of the cushion being placed nearer the floor, and the roof line came down proportionately. With the lower seat the steering wheel must be

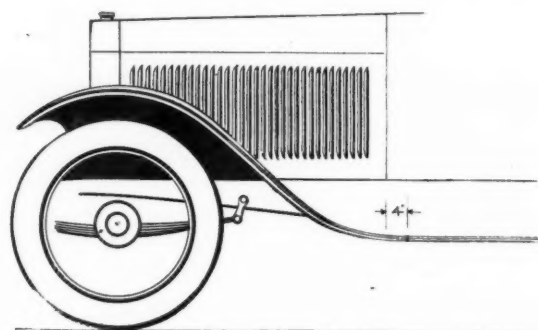


Fig. 2—Front fender running board joint

placed lower and more room provided for the driver between the dash and seat back.

Practically all cars have a kickup in the frame at the rear to provide clearance for the rear axle, and the portion of the frame forward of the rear guard is $2\frac{1}{2}$ to 3 in. lower, making an average height from the ground of 25 in. To make a low-looking car this height should be 2, or preferably 3, in. less. The Pierce chassis has a double drop frame, the drop starting back of the dash and extending to the usual point in the rear. Other makers do not see enough advantage in this construction to adopt it; in fact, some who used it in the past have discarded it. Other builders have the body sides extend down over the frame, as illustrated in Fig. 3. The base line of the body is about 2 in. below the top of the frame, the floor boards being of this thickness, with just enough clearance not to touch above, and the body is supported on brackets. This is good construction, as there is less running length of contact, and squeaking due to friction between body and frame is obviated.

Sport Body and Conservative Type

Bodies can be divided into two classes on the basis of height—the sport body and the conservative type. The former is lower because the user is willing to sacrifice some degree of comfort for the sake of appearance; the latter is designed on lines that give the maximum of

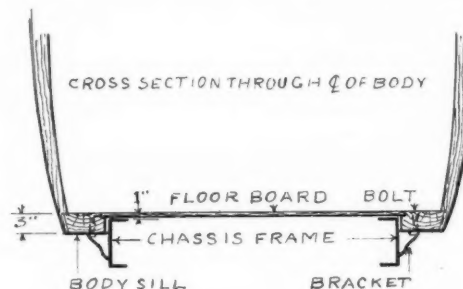


Fig. 3—Mounting of body on frame

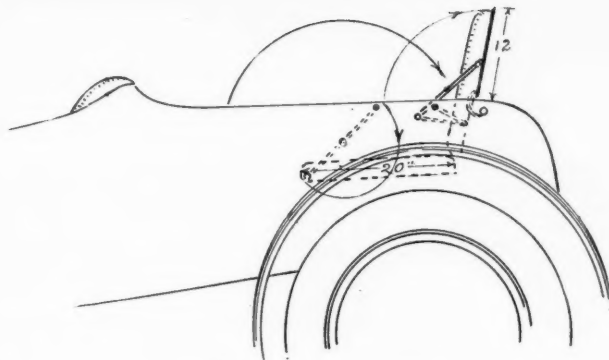
comfort. A body can be made very low if the cushions are placed on the floor, but it requires a young, slender person to get in and out of a body like this. A good rule for height is to have the eyes of a person seated in a car level with those of one standing on the ground. When this is the case a body will look right.

Fig. 4 is a four-passenger, close-coupled touring body, and illustrates the bevel-top edge that has come into such extensive use within the past year. Section A-A shows this in larger size, and the dimension $\frac{5}{8}$ in. is a maximum. A moderate bevel looks well, an excessive one looks showy. This bevel gives the appearance of reducing the height of the side more than it actually does. Sometimes a paint stripe line is added about $1\frac{1}{2}$ in. below the bevel, on the side. To look well it must be an inconspicuous stripe. The only place for a wide stripe is on the top, close to the outer edge. The popularity of the bevel edge is due to the fact that it allows the line to be continued from the radiator through the engine hood and to the rear without raising perceptibly. The back of the rear seat is high, but is concealed by the gypsy curtain quarter.

Proper Height of Body Sides

The dimensions given are for comfortable seating. Some makers have the sides 4 and 5 in. lower than here illustrated, but this will not give a feeling of security. The sides must come above the seat cushion sufficiently to make the passenger feel that he is riding in the car and not on top of it. To make the top of the driver's seat inconspicuous is the most difficult task for the body builder. The narrow second cowl of moderate height, and blending with the bevel edge, is largely used; but a cowl as shown in the illustration is coming into popularity. Handles on the outside of the doors are shown; these seem to be coming back into favor, probably on account of the trouble of finding the inside handle. The outside handle serves to close the door, and does away with the pad used in conjunction with the inside one.

The robe rail and the folding seats are two parts of the touring body that are prominent, and call for attention. The robe rail formerly was a stiff metal bar with handles at the ends. In a few cases this is retained, but the majority use an adjustable strap. The seats are practically all of the flush-folding type. Very few have the inner arm rest, and a depression is made in the front-seat back to receive them when down. Different plans are used to conceal them, but unless this is made in the form of a locker, which is expensive to build, the seat



Folding seat dimensions

had best be left exposed. The drop curtain is not a success, because the space into which the seat folds is used as foot room when the seat is up, and when the curtain is used the cut is as low down as possible, and its edge interferes with the knees.

The use of the molding to cover the opening of the doors has been superseded to a great extent by having the panel project beyond the pillars, as shown in Fig. 4, representing a section of the door. In one construction this thin ledge projects over the body panel and forms an offset, the doors giving a raised panel effect on the side of the body of approximately $\frac{1}{8}$ in. Carelessness of the builder in making bodies in which this offset varies from $\frac{1}{8}$ to $\frac{5}{16}$ in. has brought this method into discredit in high-class work, and it is now more customary to have the door set in flush with the body panel and show a narrow opening all around. This opening must be uniform, or it looks bad. The ledge on the door is formed by wrapping the panel sheet over the steel edge plate.

Folding Seat Details

Fig. 5 illustrates the folding seat used on runabouts. This is just the customary seat in which the two lids of the deck of the hammer are turned, one to an upright position to the back, and the other forward one revolved over to form the cushion, but the illustration is an improvement over the majority in that the height of the lid forming the back is less. The space required to make the well opening is 30 to 32 in. long, and it has been usual to divide this in the middle, making the lid that forms the back 15 or 16 in. high. The illustration shows this cut to 12 in. There was also provision for a top covering for this seat shown on several cars, the stand-

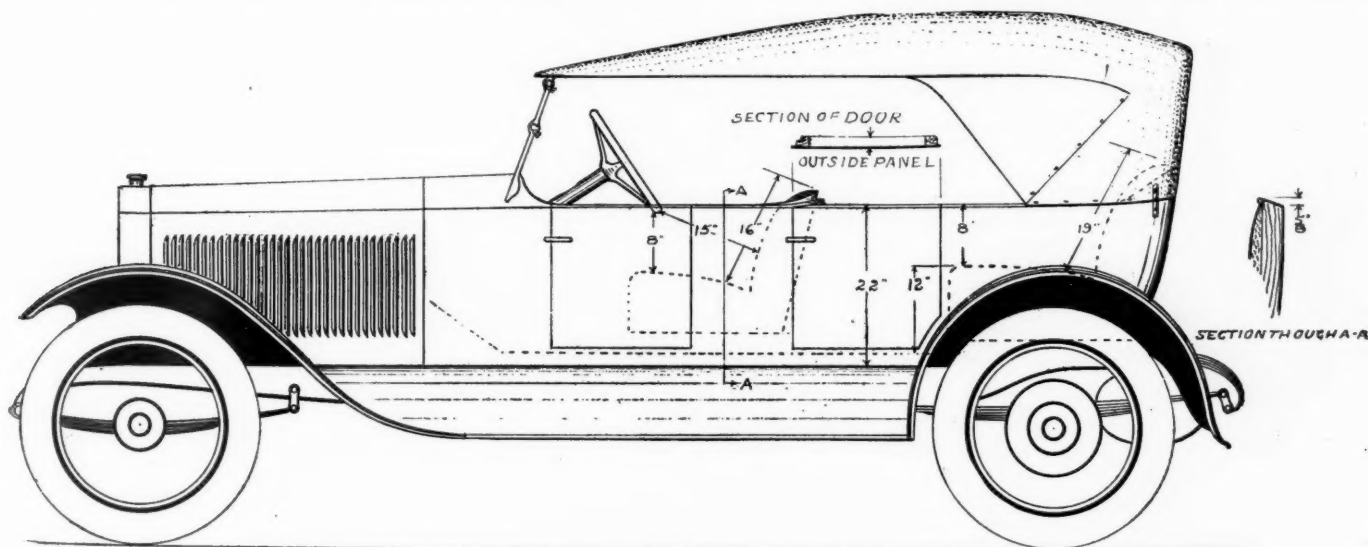


Fig. 4—Elevation of close-coupled touring body with bevel top edge

ards and sockets for securing same being concealed in the well when not in use.

Most bodies are made with a wood framework, and over this is the sheet or aluminum panel, the method of framing and assembling the panels on the framework being changed according to the scale on which the model is produced. The all-metal body has been made almost from the beginning in the open type. It has the advantage that production can be handled more satisfactorily, and cost and time more readily controlled. This kind of a body, when the doors are closed, is apt to make a noise like the clanging of several pieces of loose steel. However, an all-metal body can be produced and the doors made to work satisfactorily. This can be done in almost any one of the present designs, and without material difference in the manufacturing costs, provided the ex-

perimental work is carefully done. With the all-metal body, either of castings or pressed steel—and the latter is the one most generally used—the preliminary work is the chief item, because once jigs, dies and patterns are made, it is almost impossible to make changes.

The open body is the standard stock proposition of all manufacturing concerns, and the all-metal body is bound to be the one most used, except among those who cater to a fluctuating trade that demands novelties. The older construction of a wood framework and metal construction will meet best the requirements of this trade. Either form of construction will meet all the demands of service and wear. The wood and metal, however, has the advantage of not requiring such a heavy outlay for tools and machinery, and that changes in models can be arranged for more easily.

Reversible Engines for Marine Work

WITH the exception of some small boats fitted with two stroke engines, practically all motor boats now are equipped with reverse gears. However, the four stroke engine may also be made reversible, and it would seem that if boats are to be equipped with electric starters, which can easily be arranged to start the engine in either direction at will, the reversing possibilities of the four stroke engine may well be taken advantage of, because very little additional mechanism is required, and this allows of dispensing with a bulky and heavy reversing gear.

General Reversing Principle

Wolseley Motors, Ltd., of Birmingham, England, have been giving some attention to this problem and have developed a design on which they have secured a British patent. In reversing the direction of rotation of the crankshaft of an internal-combustion engine, in which the sequence in which the cranks are operated by the pistons is the same in both directions of revolution, it is convenient to utilize the same camshaft both for forward and backward running, and it is well known that this can be effected by driving the camshaft through a three-bevel drive which is provided with a jaw clutch so that the direction of drive between the camshaft and the crankshaft may be reversed, the camshaft always revolving in the same direction.

The Wolseley invention applies to multi-cylinder engines in which there are two lengths of crankshaft, each of which if used alone with its corresponding cylinders and pistons could be reversed through the medium of a three-bevel drive, but which if taken together could not be so reversed, if used in connection with a camshaft on which the cams were un-

alterably fixed and which was common to all the cylinders; and consists of a modification of the invention described in Patent Specification No. 14480 of 1916, according to which there is used, in respect of each length of crankshaft, a camshaft in respect of the valves for each corresponding group of cylinders, and the camshafts are both driven through a single reversing mechanism and connected with one another through the medium of a clutch which can be moved to couple two shafts together in two different angular relations to one another, namely, in the relation to one another required for the forward running of the engine, and in the relation to one another required for the reverse running of the engine.

A, A are groups of cylinders of an eight-cylinder engine and B is the crankshaft. The camshafting for operating the valves is formed in two lengths C, C', which may be coupled together by a clutch D, and may then be readily uncoupled by moving the clutch endwise into its mid position shown clearly by Fig. 2. These lengths of shaft are both driven from the crankshaft through the medium of the spur wheels f and g, three-bevel drive e, e', e'', and bevel wheels h, h'. The clutch D is slidable upon a splined end of the shaft C', and cannot therefore turn in relation to such shaft. The end of the shaft C is formed with teeth c', c'', which differ substantially in size or shape, and when the clutch is in its mid position, as shown by Fig. 2, are within a chamber d of the clutch which constitutes a neutral space, and the shafts C, C' are then unclutched from one another. Within walls of the clutch, which are at opposite sides of the chamber d, are formed gaps or notches d', d'', of which the gaps d' correspond in size to the tooth c', and the gaps d'' correspond in size to the tooth c''.

Method of Operation

In reversing the engine, the endwise movable member of the clutch mechanism of the three-bevel drive is operated to reverse such drive, and the clutch D is moved to its mid position, thereby uncoupling the camshaft C' from the camshaft C. As the camshaft C is then turned by the crankshaft, the clutch D is pressed still further in the direction in which it has been moved to uncouple the shaft C' from the shaft C, and immediately the gaps d', d'', of the wall of the clutch which is then pressing against the ends of the teeth c', c'', of the shaft C come into register with such teeth, respectively, the gaps slide over the teeth and couple the shaft C' again to the shaft C.

Each gap in one wall of the clutch is, however, as indicated by broken lines, Fig. 3, in such angular relation to the corresponding gap in the other wall of the clutch as to insure that when the gaps in one wall of the clutch have been disengaged from the teeth of the shaft C, and the gaps of the other wall have been engaged with such teeth, the shafts C and C' will be in their relative positions for running the engine in the reverse direction. In the particular arrangement illustrated, each gap of one wall of the clutch D is at an angle of 45 deg. with the corresponding gap of the other wall.

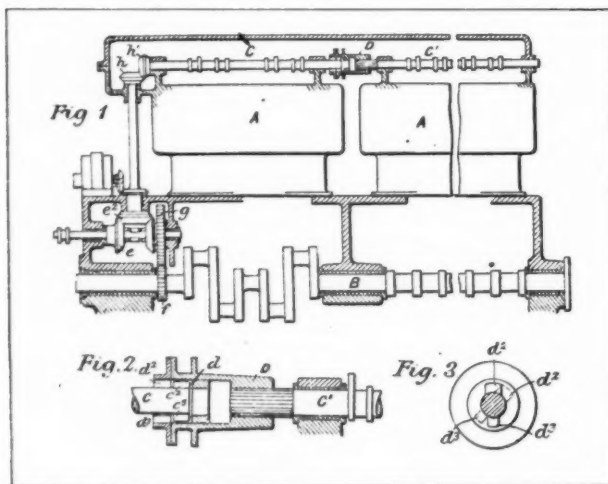


Diagram of eight-cylinder reversible engine

MANUFACTURERS' MERCHANDISING

The Farm Tractor Instruction Book

Send It in the Period Between Purchase of Tractor and Its
Delivery—Use a Series of Letters to Sell the
Book to the Farmer

Part I

H. L. THOMSON of the Moline Plow Co. gave some of the best advice that has been offered to the automotive industry in many months when he told his story of what a good instruction book should contain before the S. A. E. tractor engineers at their tractor dinner in Kansas City last week.

The worst trouble of the instruction book for a tractor, and the same can be said with regard to an automobile or a motor truck, is that it gets to the purchaser of the machine at the wrong time and in the wrong way.

First: It gets to the buyer of the machine in the tool box when the machine is received. This is wrong—the wrong way and the wrong time.

The instruction book should be sent to the buyer between the time the order is placed for the machine and the date when the machine is delivered. That is the psychological time for the job.

There Are Many Reasons

Why? There are many reasons. The buyer has more time to read the book before the machine is delivered. He is anticipating the machine. When it is delivered he will start immediately to use it, and will not have the time to read the instruction book.

Again: Much of the injury done to a tractor is done the first week. Whatever part is neglected in lubrication the neglect is worst the first week. The engine is abused more the first week; in fact, it is not extreme to declare that more injury is done to some machines the first week than in 6 months of service after the farmer has mastered the machine. Help him to master the machine before it gets into his hands.

Further: When delivering the instruction book to the farmer between the time of ordering the tractor and the date of delivery, carry on a kind of correspondence scheme with the farmer. Send out a series of letters.

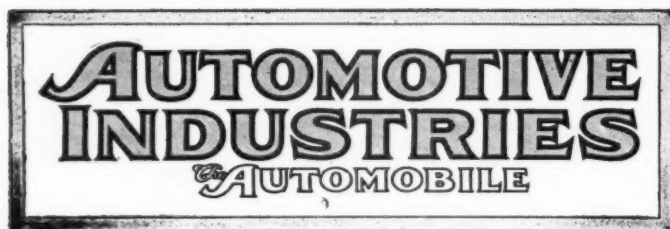
Letter No. 1.—Send this out a few days before the instruction book is mailed. Tell in the letter how important it is to read the instruction book through and through. It is a part of the tractor. So sell the book to the farmer.

Letter No. 2.—With the second letter forward the instruction book. In this letter draw attention to one part of the tractor and one part of the book. If it has to do with engine lubrication, make the letter a kind of appetizer, so that the farmer will certainly read that part of the book relating to lubrication and will understand it better. Perhaps you can take up carburetion, or draw his attention to it.

State Specific Facts

Letter No. 3.—You may write one, two, or three more letters, according to the length of time elapsing between the date of ordering and the date of delivery. These letters should each deal with some part of the tractor as described in the instruction book. Make each letter relatively brief. Use short sentences. Your letter must do more than just tell the farmer to read pages 10, 11 and 12 on engine oiling. It must state specific facts with regard to your system. It might be you would state: "In our pressure oiling system the oil is pumped to the three bearings of the crank shaft under a pressure as high as 30 lb. The bearings of the crank shaft are so made that this pressure cannot squeeze the oil out before doing its work. There is no oil groove in the bearing that would let the oil be forced out; in fact, the shims are so made as to assist the bushing in holding the oil pressure. This is well told and illustrated on page 11, near the middle of the page."

Mr. Thomson had a lot of other things to say about tractor instruction books, so far as their makeup is concerned. That part of his talk before the Society of Automotive Engineers will be told in AUTOMOTIVE INDUSTRIES next week. After the meeting there were several old tractor makers who declared Mr. Thomson's talk to be one of the best and most practical they had heard for some time.



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Intercity Motor Truck Lines

DURING the past few months there has been considerable talk regarding intercity motor trucking. With the increasing effect of rail embargoes, coupled with the fuel shortage, there is no doubt that a great many intercity lines will be established the coming summer. It is expected that in the Middle West, as soon as the roads have become fairly dry, many towns will be connected up by such lines.

The value of this mode of transportation cannot be over-estimated, and the Interstate Commerce Commission should look upon the subject with an open mind and not permit itself to be moved by any previous prejudices against the operation of lines of this sort. It is encouraging to note that the commission has approved the line connecting Toledo, Cleveland, Detroit and Chicago. Recently, when a line was to be opened between Toledo and Detroit, the plan had to be abandoned because of opposition on the part of the commission.

Intercity transportation by motor trucks can be carried on successfully only on an organized basis. A company must be incorporated and it must have

sufficient backing to properly finance the undertaking. To start a corporation of this kind going a large amount of investigation is required, and a considerable investment must be made. Once the service is in operation, there is no doubt that it will pay if the management is good. In fact, if the railroads are prevented from carrying freight under 25 miles, or even somewhat greater distances, some other means of transport must take their place, and there is nothing more logical than the motor truck train.

An undertaking of this kind should also have the backing of the local authorities, as it is of the nature of patriotic work, and one of the best kinds of co-operation it could have would be proper road maintenance. The intercity commerce which would be handled by truck lines is of a highly important nature and particularly important as regards moving farm products to nearby cities. These lines, therefore, may be classed as public utilities of the most necessary kind and should be encouraged.

Behind Orders

A YEAR ago we heard reports that factories had on hand large numbers of cars of which they could not dispose. This was not true of a great many companies, yet there were some that had in their storerooms cars awaiting orders from dealers. To-day it is entirely different, and a much more healthy condition, in a way, prevails. Owing to war work and traffic conditions factories have not been able to turn out the number of cars which they would have produced in normal times, with the result that deliveries cannot be made nearly as promptly as dealers desire. The actual purchases of cars throughout the country seem to be very close to what would be expected when it is considered that nearly two million men have been withdrawn from their ordinary positions in life and concentrated in and around the army camps. Add to this the large number of men who have entered other fields of Government work where their usual habits are altogether changed, and you have a condition which is bound to cause a reduction in passenger-car sales. Nevertheless sales have held up remarkably well in nearly all parts of the country. The result is that with the factories turning out large quantities of war work the dealers cannot get as many cars as they desire.

The used-car market is a good index of conditions. The used-car shows held throughout the country indicate that there is a rapid increase in the demand for these cars. They are not only being bought by people for city use, but they are also being purchased by suburbanites who desire to convert them into light trucks to carry their farm products to market.

The larger producing companies have had to reduce their production to a large extent to meet the orders for all sorts of material which have been coming in from the Government. The result is, naturally, that although the product is spread as evenly as possible over the country, in a spirit of

fairness to all dealers, manufacturers have not been able to fill the demand.

People who have not heeded the advice of the dealers to buy their cars early are surely going to notice that it is not as easy to get quick delivery on a car as it was a year ago. The spring thaws are going to make drive-away conditions bad for a period of about two months. As a matter of fact, it is far easier to drive a car from the factory to the distributing point in January or February than it is in March and April.

Reviewing the situation, it is now clear how unnecessary it was to urge forced curtailment of production. Reduction in the amount of floor space available and the number of men on the job has cut the output of the factories to about the same extent as the Government would have done had it attempted to effect a reduction by arbitrary means.

Live Axle Tractors

FOR many years it was a familiar saying in automobile engineering circles that live axles were all right for light cars, but would not stand up on heavy vehicles. To-day, however, the great majority of motor trucks have live axles. It took quite some time before the proper materials for gears and shafting, the proper tooth pressure allowance and the best kind of shaft fitting for such axles were determined, and while knowledge concerning these factors was accumulating there was a considerable proportion of failures, especially of axle shafts. At the present time practically nothing but alloy steel, heat treated, is used for axle shafts; the factor of safety allowed is only about two and the wheels and gears are fitted to the shafts by means of splined joints.

The experience thus gained may be made available in the tractor industry. What the maximum torsion in the axle will be can be calculated quite closely from the engine dimensions and the gear reduction. Abnormal shocks due to jamming-in of the clutch may and should be guarded against by limiting the clutch capacity to a moderate excess over the maximum engine torque.

What is probably bothering tractor designers is the enormous dimensions found necessary for the axle parts if cold-rolled stock is used for the shafting and the wheels and gears are keyed on in the usual way. The solution of the problem lies in the use of chrome-nickel steel for the axle shafts and of high-class construction throughout. A final drive by two sets of spur wheels would seem to offer important advantages, as it obviates the heavy end thrust encountered with bevel and worm gears and permits the use of a relatively small differential. This could be combined either with a bevel-gear reduction or with another spur-gear reduction, depending on whether the engine set lengthwise or crosswise of the frame. Worm drive, of course, makes for simplicity, but it is a fact that the efficiency of the worm is at its maximum at speeds far beyond those which could be employed on tractor axles. There is also a well-founded impression that worm gearing will not stand much abuse.

Refinement of Lubricating Systems

A GOOD example of how automobile mechanism is gradually being refined is furnished by the engine lubricating system. We started out with the oil cup on the crankcase, borrowed from stationary practice, and with the variable level splash system, but arrived within a relatively short time at the constant level or circulating splash system. This served satisfactorily for many years, until the maker of an engine of special design, which by reason of its unconventional features consumes considerable oil, introduced the plan of raising the oil level as the load on the engine increased and lowering it with decreasing load. He has since found a number of followers among manufacturers of conventional engines.

In engine lubrication the best practice, of course, is to furnish just enough oil to the bearing surfaces to maintain an oil film between them at all times, but no more. Any excess supply of oil not only results in waste of the lubricant, but also in a smoky exhaust and in carbonized cylinders. At light loads, when the pressures between the bearing surfaces are small, there is little danger of the oil film breaking down even if the feed of oil to the bearing is slow. On the other hand, when the engine is working under substantially full load, the great heat produced tends to reduce the viscosity of the oil, and as at the same time the pressure on the oil film is greatly increased the film is apt to break down, unless it is constantly renewed. With constant level lubrication the level and the size of splashers must be determined to meet maximum load requirements, with the result that at light loads the engine tends to soot up and smoke. These difficulties can be obviated by varying the oil level with the engine load.

Increased engine speeds and the corresponding rise in bearing pressures have led to a more general use of force-feed lubrication. The pressure on the oil is produced by a gear pump, but ordinarily it is maintained constant by a relief valve irrespective of the load on the engine. With constant pressure on the oil the tendency will be to feed at the same rate regardless of the load, and this involves the same disadvantages as the constant-level splash system. One manufacturer has improved upon this constant pressure force-feed system by providing a by-pass valve in the oil feed line, controlled by the suction in the intake manifold and so arranged that when the suction exceeds a certain amount (nearly closed throttle) the pressure is relieved and oil is fed to the bearings by gravity only. This, therefore, constitutes a two-stage oiling system, employing pressure for the normal range of engine operation and gravity for idling.

It would seem a simple matter to provide for gradual variation of the pressure on the oil with variation of engine load. The oil pressure, of course, is determined by the settling of the relief valve. This is a spring-loaded valve and its spring pressure can be varied by connection with the throttle.

□ Latest News of the

First Liberty Planes Shipped

American-Built Battle-Planes On Way to France—Broke Speed and Climbing Records

WASHINGTON, Feb. 21—The first American built battle planes are to-day en route to the front in France. These planes are equipped with the first Liberty airplane engines from machine production. One of them in a recent test, surpassed all records for speed and climbing for planes of battle type.

Engine production which began a month ago is now on a quantity basis and the peak of production will be reached in a few weeks. Only the 12-cylinder type is being manufactured, as developments abroad have made it wise to concentrate on the high powered engine instead of the 8-cylinder one.

This first shipment though not in itself large, marks the final overcoming of many difficulties met in building up this new intricate industry. The great remaining problem is to secure the thousands of skilled mechanics, enginemen, motor repairmen, wood and metal workers and so forth, needed to keep the planes in perfect condition.

Great Mechanical Force

This great engineering and mechanical force at the airdromes, the flying fields, and the repair depots, both here and behind the lines in France, is a vital industrial link in the chain to air supremacy. Without them, the planes turned out are useless and the flyers helpless.

The above statement issued to-day by Secretary of War Baker, is designed to give as complete a picture as permissible, under military requirements, of the progress of our air service.

In reviewing the air problem, Secretary Baker points out that after three years of warfare the total number of planes able to take the air at any one time on either side of the western front, has not been over 2500.

46 Mechanics to a Plane

This combined with the fact that 46 men are required on the ground for every plane in the air, gives a better perspective of European aviation conditions than has been commonly possessed on this side.

Every plane in the air requires two replacement planes on the ground and one training plane for every pilot who eventually reaches the front, with a spare

engine for each plane. The first American-made battle planes were not due in France under the original schedule until July.

Automobile Men Hear Andrews

WASHINGTON, Feb. 2—Major Barrett Andrews who is here from the French front and served on General Pershing's staff, yesterday addressed a number of the automobile experts of the army forces here and also a number of truck manufacturers on the experiences of the motor transport section abroad. Secrecy was requested regarding the address as a number of military secrets were disclosed.

10,000 at Newark Opening

NEWARK, N. J., Feb. 16—Ten thousand persons attended the opening of the tenth annual Newark automobile show at the First Regiment Armory to-night. All the 60,000 sq. ft. of floor space has been reserved by eighty-six exhibitors who are displaying 186 motor vehicles. In this total forty-four makes of passenger cars and twenty-three makes of commercial vehicles are represented. Thirty-four accessory dealers have booths in the balconies.

Barlow Joins Moto-Meter

NEW YORK, Feb. 20—A. E. Barlow has been appointed sales manager for the Boyce Moto-Meter Co., Long Island City. He will have full charge of distribution through dealers and jobbers and will make his headquarters at the factory. Barlow was formerly sales manager for the American Ever-Ready Co. and for Findeisen & Kropf, Chicago.

Push "Return Load" Work

WASHINGTON, D. C., Feb. 18—The Highway Transport Committee is working out a plan under the "return loads" system to relieve congestion east of the Mississippi River. The plan is to first establish return loads through Boston to Washington, then New York to Buffalo and next Philadelphia to Chicago taking in Cleveland, Detroit, Indianapolis and Cincinnati. At first the aim will be only to hit the large cities, but later it is planned to include the smaller towns also. The committee is working through the Chambers of Commerce of the various cities on the routes, pointing out to them the need of getting together the man with goods to ship and the man with a truck empty or partly filled. Letters are going forward to-day which aim to soon have the system in operation. George P. Wilson, Secretary of Transportation for the Allied Trades Body, Philadelphia, will actively co-operate with the committee.

Much Opposition to Liberty Tractor

Idea Berated at Second Tractor Dinner of S. A. E. in St. Louis

KANSAS CITY, Feb. 14—The 200 who attended the second tractor dinner of the Society of Automotive Engineers at Hotel Baltimore, last night, heard the rumored Liberty tractor generally berated by the entire tractor industry. The Liberty tractor had not a friend present.

A. P. Yerkes of the Department of Agriculture, Washington, D. C., read extracts showing that Washington was opposed to it and that there was not the slightest sentiment there in favor of it. J. B. Bartholomew, president of the Avery company, led the crusade against it, declaring that the rumors already spread were holding up tractor sales, in that farmers were thinking some form of government standardized tractor was coming out and were not going to buy until they had seen it.

Much injury can come to the tractor industry at present by continued circulation of such rumors. The necessity to-day is for tractors such as are being built. There is too great a scarcity of engineers, tool makers, and draftsmen to go into the development of a Liberty tractor. If a Liberty tractor were to be developed by the government the matter should be kept secret, not only until after it was designed, but until it was tested out and found satisfactory and ready to go into production. Otherwise a stopping of tractor sales will ensue.

Dent Parrett, president of the Parrett Tractor Co., in his remarks as toastmaster defined tractor standardization as a commercial investment. A tractor standard to be worth while must save the manufacturer money, and it must also enable him to speed up production. The object of tractor standardization is not to restrict the versatility of the engineer, nor not to dwarf his originality of design, but rather to free him from petty details.

H. L. Thomson of the Moline Plow Co. gave some of the best suggestions regarding tractor instruction books that has been made public. He recommended that tractor manufacturers deliver the book to the buyer in the time between the placing of the order for the tractor and the delivery of the machine; and, further, that in the same period a series of letters be sent to the buyer drawing attention to different uses of the tractor and to those parts of the instructions.

(Continued on page 425)

Automotive Industries

No Alarm Caused by Proclamation of Export and Import Control

Not Intended as Embargo but as Regulatory Measure—Exporters Say Needed Licenses Will Be Issued—Rubber Importers Expect No Harmful Results

NEW YORK, Feb. 16—The President's proclamation taking over control of all exports and imports through a licensing system, is not viewed with great alarm by the automobile industry. The proclamation itself specifically states that it is not to be considered as in the nature of an embargo on either exports or imports, but that it is designed as a regulatory measure pure and simple.

Under the terms of the proclamation, certain products deemed of essential value in winning the war cannot be imported or exported except under license. Where products are vitally necessary to the carrying on of the automobile industry, it is not anticipated that great difficulty will be encountered in obtaining licenses. This applies to imports.

Insofar as exports are concerned, it is pointed out that the industry has been suffering for the want of tonnage for some time, and that such additional restrictions as may be imposed under the terms of the proclamation are not likely to make a great difference. Motor cars and trucks are as essential to the Allies as they are to the United States. Space must be found for them in vessels and the opinion of prominent exporters is that licenses will be forthcoming when and as needed.

One serious aspect of the situation which chiefly concerns exporters is that if it should be decided to limit very strictly the exportation of motor cars and trucks to such countries as South America, South Africa, Australia, etc., a hardship would be imposed because of the virtual severance of business relations which have taken years to build up.

It seems likely that the War Trade Board through its licensing system will, to a certain extent, limit the carrying by ocean-going vessels of certain products which may be termed non-essential; just what this curtailment will amount to cannot be stated at this time.

In general, however, a feeling prevails that the proclamation is in effect a gigantic checking measure with the aid of which it will be possible to efficiencize both American shops and those of her allies.

For example, if foreign governments

should request licenses for the importation of great quantities of any one raw material this would indicate to American authorities, who know of present production possibilities abroad, an expansion of facilities with increased production.

This information could, in turn, be used to advantage in perhaps reducing production of similar articles by a certain percentage on this side.

In other words, it would tend to eliminate duplication of effort and promote efficiency in that it would indicate where certain raw materials might be fabricated in the country of their origin to better advantage, perhaps, than in some other country.

Exports of motor cars and trucks reached new high levels in 1917. During the year a total of 65,086 cars and 14,284 trucks were sent over-seas. Though this total of nearly 80,000 vehicles seems a lot, exporters point out that the shipping space required for them is

very small when compared with the total number of ships afloat. Allowing about 6 tons, cubic measurement per car or truck, the entire lot could be stowed away in 96 ships of 5000 tons capacity.

Obviously, however, a ship cannot be completely loaded with motor cars or trucks. The space might all be filled, but the carrying capacity would not be reached by a considerable percentage. In this connection, Peter Steenstrup, vice-president of the General Motors Export Co., says:

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Approve Present Contract Method

NEW YORK, Feb. 16—That the present method of allotting contracts for military trucks, whereby the government deals directly with the various makers, is the best method and should not be changed, was the consensus of opinion following a joint meeting of directors of the National Automobile Chamber of Commerce and the Motor and Accessory Manufacturers Association Feb. 14. The meeting was called to consider methods of letting such contracts. A unanimous vote of confidence was given Christian Girl for the manner in which he is carrying on his work. The matter of placing more prominently before the public the inherent advantages of motor haulage as a means to help relieve railroad congestion is being considered.

Washington News Letter

President's Proclamation Expected to Influence Pro-Germans—No Restriction of Rubber Imports—Revise Daylight Bill

WASHINGTON, Feb. 19—Automotive industries are vitally concerned with the events in the Capital this past week. The chief object of the import and export proclamations of the President is to prevent the products of the United States reaching Germany and also to influence what is at present pro-Germanism in certain countries to a change of heart by restraining our exports to those countries.

For example, Argentina is at present considered pro-German. Brazil, on the other hand, is friendly to the American policies. Consequently it is unlikely that shipments to Brazil will be curtailed while it is very likely that but few articles will be allowed to be exported to Argentina.

In addition, the proclamations will, according to official announcement, allow for the curtailment of export and im-

port of "non-essentials." For example, certain articles used in this country may be considered non-essential during the war, and if they are dependent upon materials imported from foreign countries, such importations may be curtailed.

The War Trade Board when confronted directly with the question "Will crude rubber for the manufacture of passenger car tires be curtailed in importation?" replied that it considered such tires useful and that it was unlikely that the import of the rubber for tire manufacture would be curtailed.

Another result hoped for from the proclamations is the diversion of material. For example, mahogany is needed for airplane propellers and is instead being used in great quantities for household furniture. By the license plan, the Government expects to prohibit the im-

portation of mahogany for household furniture use, thus increasing the amount available for propeller manufacture. Another benefit anticipated through the curtailment of non-essentials is an increase in shipping tonnage available for carrying supplies to France.

It may be definitely stated here that at present there is no specific thought of curtailing the export of automobiles or the import of any materials necessary to the manufacture of automobiles or other automotive products. Officials of the War Trade Board stated, however, that they could not foretell the needs of the next few months, and it is possible that such curtailment may be found necessary for the benefit of the military establishment.

As reported last week, there is a rumor that the automotive activities of the War Department, excepting aviation, will be co-ordinated under one head. At this time there is no reason for changing this view, and in fact it may be said to have been strengthened considerably by additional reports within the past few days.

If this plan is placed in operation it will mean that the purchasing, procurement, maintenance, engineering and all other details regarding trucks for the entire army, including Quartermaster, Ordnance, Signal, Medical and Ambulance Corps, will be done in one office under the supervision of one man.

It is a plan that will abolish a considerable amount of duplication of effort and much confusion that now exists, besides adding to the efficiency of the army by reducing the numbers of kinds of trucks in use with the consequent reduction in the number of parts needed.

The daylight bill as amended last week in the House calls for a shift in working hours from March to October in place of an all-year shift. The amended bill may be considered greatly superior. Detroit, Flint and other Michigan cities operating under an eastern time schedule for more than a year have experienced the inefficiencies of the all-year-round plan. Workers in the winter months in Detroit start in at 7.30, which is really 6.30 central time, the real Detroit zone find the first few hours of the day as dark as night with a consequent slackening of production which affects their efficiency throughout the entire day.

Homer-Laughlin Takes Over Langbein

LOS ANGELES, Feb. 20—The auxiliary transmission for Ford cars and trucks, formerly styled Langbein, has been taken over by the Homer-Laughlin Engineers Corp. and will henceforth be styled Laughlin-Langbein auxiliary transmission.

Gay on War Trade Board

WASHINGTON, D. C., Feb. 18—E. F. Gay, formerly Dean of the Harvard School of Business Administration, has been appointed to the War Trade Board representing the United States Shipping Board and will devote his attention to import problems and their relation to the conservation of shipping tonnage.

Big Improvement by Railroads

Idle Cars Reduced by 44 Per Cent in Last 12 Days—Coal Moving Freely

NEW YORK, Feb. 20—The railroads are in a better condition at present than they have been for a long time past. During the period between Feb. 6 and Feb. 19, congestion of cars on lines East of the Mississippi was reduced by 44.2 per cent.

In other words, there has been a reduction of 71,130 cars of the total number above normal that were standing idle on the tracks on Feb. 6. For the last week the situation has shown continued improvement and the mild weather has assisted greatly in moving cars. The peak of railroad congestion was reached the first week in February.

Reports made yesterday by eastern railroads give in detail the number of cars above normal on their tracks. These are cars which are stalled, side-tracked, unduly delayed or held up for any reason, and, therefore, represent an excess above that number which would be the normal flowing traffic. This is the measure of railroad congestion. The following table shows the number of cars above normal on eastern roads, Feb. 6 and Feb. 19:

	Feb. 6	Feb. 19
Eastbound loads.....	59,784	39,257
Eastbound empties.....	13,345	3,140
Westbound loads.....	39,841	28,287
Westbound empties.....	47,934	19,090
Total loads.....	99,625	67,544
Total empties.....	61,279	22,230
Grand total.....	160,904	89,774

The report shows that even in the last 24 hours ending at noon yesterday, there was a gain of 5000 freight cars in relieving congestion. The handling of coal has greatly improved in the last few days. Reports show that the flood danger on the Ohio River is abating, the river falling at Pittsburgh, Parkersburg and Wheeling.

A statement has been issued by the Pennsylvania Railroad in which it is stated that its lines have moved twelve times as much hard coal in the first 18 days of February as in the same period in January. Other freight had also been greatly accelerated. It is expected that the improvement will continue.

Truck Inspectors Wanted

WASHINGTON, Feb. 18—Open, competitive examinations for inspectors of military trucks and assistant inspectors of motor vehicles to fill vacancies in the Quartermaster Corps, U. S. Army, and the Ordnance Department at large of the War Department, have been announced by the Civil Service Commission. The duties of the appointees will be in connection with the production of standard military trucks and motor driven vehicles. In most cases it will require following the raw materials through various

processes to the completion of the finished product in the various factories to which appointees may be assigned. Inspectors of trucks will be paid from \$1,800 to \$2,400 per annum and assistant inspectors \$1,200 to \$2,000. Certain qualifications are essential and on account of the urgent need of the Government for men in these branches papers will be rated promptly by the Commission.

Zinc Prices Fixed

WASHINGTON, Feb. 20—Maximum prices of 12 cents per lb. f.o.b. East St. Louis for Grade "A" zinc, 14 cents for plate zinc, and 15 cents for sheet zinc, f.o.b. plant, have been fixed. This agreement, made by the War Industries Board with the producers, has been approved by the President. It was also agreed that the producers would not reduce the wages now being paid, and that the same prices for zinc would hold in all sales to the Allies, the Government and the public. Furthermore, producers will take all possible steps to prevent the distribution of zinc from becoming a matter of speculation, and will do everything in their power to keep up the production of zinc so as to insure an adequate supply.

Chandler Earns \$2,382,403

CLEVELAND, Feb. 20—The Chandler Motor Car Co. earned a net profit of \$2,382,403 in 1917, a gain of \$666,235 over 1916. This was the amount left from a gross income of \$3,277,715, which was \$843,945 more than 1916. The earnings equal \$34 a share on the outstanding stock, compared with \$24.50 in 1916. The balance sheet follows:

	1917.	1916.
Land, buildings & equip.	\$659,056	\$475,062
Good-will	5,000,000	5,000,000
Cash	698,976	1,800,422
U. S. Liberty bonds....	279,190	.....
Customers' notes	15,928	14,215
Customers' accounts ...	101,481	53,181
Creditors' debit balances	28,783	.....
Cars sold for export....	192,114	123,287
Merchandise inventory..	3,018,742	1,876,985
Invest. in subsidiary co.	35,090	32,000
Advances to		
manufacturers	35,229	72,867
Miscel. notes and accts.	25,004	.....
Deferred assets	39,011	30,830
Total	\$10,119,604	\$9,478,849
Liabilities:		
Capital stock	\$7,000,000	\$7,000,000
Unpaid purchases and		
exp.	22,349	905,799
Dealers' deposits	97,860	113,928
Dividend payable	210,000	210,000
Accrued taxes	28,334	53,122
Reserves	97,872	5,214
Surplus	2,663,189	1,190,786
Total	\$10,119,604	\$9,478,849

Caldwell Goes With Ajax

TRENTON, Feb. 20—Elmer E. Caldwell has been appointed assistant advertising manager of the Ajax Rubber Co. of New York. He was formerly in a similar position with the Michelin Tire Co., and prior to that was advertising manager of the Canadian branch of Willys-Overland, Inc., in Toronto.

Much Opposition to Liberty Farm Tractor

(Continued from page 422)

tion book relating to these subjects.

Mr. Thomson argued for more simply written instructions, and not the language that one engineer uses when talking to another. The farmer is not familiar with this. He does not know its meaning. Blueprints should not be used as the farmer does not understand them, but X-ray wash drawings or pen and ink sketches are advantageous. A good cover should be used so that oil will not soak through or water spoil it. The book should be pocket size, and have incorporated in it complete instructions as to how major tractor repairs should be made, with illustrations of the more difficult steps. It should tell how to take up lower connecting-rod bearings; how to scrape crankshaft bushings; how to take the carbon out of the cylinders; how to grind valves; and how to put in new piston rings. The instruction book thus becomes a real service to the farmer. It should contain large oiling charts, showing how frequently parts should be oiled; there should be carburetion charts explaining adjustments; and there should be valve-timing charts and ignition charts.

Urge Community Tractors

Dean W. M. Jardine of the Kansas State Agricultural College, Manhattan, Kan., argued for community tractors in the eastern part of Kansas, where there are many farmers who could not economically own private tractors, but where one tractor could work for five or six farmers. At present they are opposed to this community system, but the State Council of Defense has Dean Jardine working on the job. He further recommended that tractor makers send one or two of their machines, or as many as they can spare, into the state for spring plowing and announced that the State Council of Defense will arrange to secure land which can be plowed at a good price per acre. A further recommendation was that tractor dealers use their demonstrating machines for contract plowing at a stipulated price per acre, the State Council of Defense securing the land to be plowed.

Kansas has to plant 24,000,000 acres of crops this spring and has approximately 70,000 fewer farm laborers than a year ago. Tractors must be used for the work. In the hot month of July over 9,000,000 acres must be plowed for winter wheat, because land plowed in July generally yields a 50 per cent increase in crop. There is scarcely any other part of the country where the tractor is more needed than in the winter wheat belt of Kansas. The weather is too hot for the horse and often the ground is too hard. Kansas has at present 6000 tractors, 2000 of which were sold last year. Tractors are needed for the 35,000,000 acres that Kansas has to harvest this year.

The 10-20 tractor is the average size used in the state.

Use Laboratory for Tractor Tests

Manufacturers Taking Advantage of Purdue Offer of Scientific Facilities

KANSAS CITY, Feb. 18—Professor G. A. Young, in charge of mechanical engineering and testing at Purdue University, Lafayette, Ind., speaking before the S. A. E. tractor engineers here, outlined the broad plans of Purdue for testing farm tractors. The university is the official testing laboratory for railway apparatus, and new designs of brake shoes, air brakes, draft gears, etc., must take the Purdue test before they may be placed on the market.

Professor Young offered his great testing laboratory for the use of tractor makers and manufacturers of engines for tractors. The testing laboratory that is ready for tractor testing is larger than the entire building housing the tractor show here, where there are displays of 43 tractor makers and more than that number of makers of accessories and apparatus.

The equipment of the laboratory includes a Diehl electric dynamometer testing outfit and there are 2600 hp. of steam power available for tractor testing work and in addition 400 hp. generated for testing uses by gasoline engines.

The Purdue aim, in so far as tractors are concerned, is to bring out by test information as to the designs of tractors which are theoretically right, those practically right and those commercially right.

In all tests a general standard will be followed and adhered to, so that information will have a permanent value and can be used for comparison years hence. The engines will be tested for power on standard gasoline and also on any special fuel that the maker may desire. The complete tractor will be tested in the field for drawbar pull, etc. In the engine test every necessary record will be taken, such as air velocity for cooling, water temperatures, oil temperatures, fuel efficiency, power output, torque, etc.

Already some tractor makers have decided to send their machines to Purdue to have them tested and some engine makers are also going to take advantage of the offer that Purdue has made.

Will Help Road Building

WASHINGTON, D. C., Feb. 18—Director McAdoo of the United States Railroad Administration has notified C. P. Coleman, Chairman of the Executive Committee of the American Association of State Highway Associations that the U. S. Railroad Administration will co-operate with the Secretary of Agriculture by transporting materials for the construction of national highways designated by him as military or economic necessities whenever the equipment is available and not needed to move supplies for the Army, Navy and the Shipping Board.

Michigan College Will Train Tractor Operators

LANSING, MICH., Feb. 18—A school which will train men for the 1918 food drive by teaching them the operation of farm tractors will be conducted here by the Michigan Agricultural College from March 4 to 16, with Prof. H. H. Musselman in charge. This training camp is for men who expect to use these tractors, or would like to fit themselves for such service on Michigan farms in 1918. Candidates for the course should report at the college on March 4 and enroll in the department of farm mechanics for the special tractor, as if they were regular students. A dozen engines, both steam and gas, will be used in the work.

Predict Demand for Industrial Labor

DETROIT, Feb. 18—If predictions are realized, there will be an active demand for all kinds of industrial labor in this city within the next 30 or 40 days. It is expected that within this time the factories now in the course of construction will have their machinery placed and be ready for production.

\$9,726,873 Increase in Michigan Deposits

LANSING, MICH., Feb. 18—Figures supplied by Banking Commissioner Frank W. Merrick show an increase of \$9,726,873 in deposits of the 512 Michigan banks from Nov. 20 to Dec. 31, 1917. The increase in commercial deposits was the greatest, being \$8,672,118; the additional sum of \$1,034,754 went into savings accounts. Commercial loans and discounts showed an increase of \$5,576,453, while savings loans and discounts reveal a decrease of \$2,653,647; commercial bonds and mortgages a decrease of \$2,253,912, and savings bonds and mortgages a decrease of \$634,455. This, however, still indicates an increase of \$44,437 in all sorts of loans over the same period the year before. Michigan state banks and trust companies maintained on Dec. 31 a total reserve of \$126,454,725.95, which was 21.75 per cent of the total deposits.

Chandler to Make Tractors for Government

DETROIT, Feb. 20—The Chandler Motor Car Co. has received a large contract for the manufacture of tractors for the government. It is estimated that the contract amounts to \$10,000,000 or more and it is understood that the tractor will be a heavy duty type to be furnished to the Allies by the United States. A large addition is to be made to the present plant and it is expected that the filling of the contract will require several years. At the same time work has been started on the million dollar factory building for the Cleveland Tractor Co. and it is expected that another tractor concern headed by George T. Comey, with whom are associated J. J. Tracey as chief engineer and Harry L. Lance as general manager, will acquire a plant in Cleveland within a few days. It will manufacture the J. T. creeper type tractor.

Thaw Brings Cheer to Detroit Factories

Relief of Coal Situation and Production Increase Result—
Anderson Electric, Maxwell and Dodge Brothers
Concentrating on Government Work

DETROIT, Feb. 16—One of the most important developments of the week here and in vicinity is the effect of the thaw. This has tended to open the roads westward, so that drive-aways are starting again from nearly all the factories. Up to this week the only gateway out of Michigan was by way of Detroit and Toledo, and this was only kept open due to the continual passage of trains of trucks for the government, followed by drive-aways of commercial cars and passenger cars.

The coal situation has also been relieved by the thaw, and general production is on the increase.

The Anderson Electric Car Co. is doing a considerable amount of government work at the present time, particularly on trucks No. 1 and No. 2, government specifications. They are also making electrical industrial trucks for the government. The passenger car output at the present time is about ten a day. They report business very good, particularly throughout the East, and excellent in Washington, where they have sold 125 cars during the past year.

The Cadillac Motor Car Co. is experiencing difficulty in shipping cars, due to freight congestion. They require from thirty to forty freight cars a day, but have been only able to secure ten or twelve a week. They are driving all eastern deliveries away, but it is impossible to drive west at present. They report automobile labor plentiful and are having no difficulty in getting all they need.

All the government work done by the Cadillac company is carried on in a separate plant, and regular production is not interfered with. They are scheduled to begin building Liberty engines in May or June.

The production of Maxwell tractors and the proposed large capacity Maxwell truck is being held up pending the arrangement of the factory to take care of government work. There is a great amount of government work coming into the Maxwell-Chalmers plant resulting in the rearrangement of production to a considerable extent.

The inability of the Commerce Motor Truck Co. to deliver cars or to secure freight cars is responsible for the great curtailment of the output of this company. They are now manufacturing six cars a day, whereas the output to fill orders would be fifteen per day.

The production of Dodge Brothers from the beginning of the concern to date is 225,000 cars. Production is not being curtailed at the present time, although work on war contracts has been started. They are unable to get enough freight cars to make deliveries, and drive-aways have been cut down owing to the impassable condition of the roads

in the West. However, drive-aways through Toledo and points East and South are going ahead without delay, and it is also possible to reach all points North.

The Republic Truck Co. has increased its production to eighty commercial cars a day, indicating that the manufacture of war trucks is not interfering materially with regular production.

The Hudson Motor Car Co. has received a contract for 2000 Nash trucks from the government. The Paige Motor Car Co., the Premier Motor Car Co. and the National Motor Vehicle Co. will each make a similar number.

The Federal Motor Truck has received a second order for several hundred 3-ton chassis for the signal corps. The first order, which was also for several hundred trucks, has been completed. The monthly production of the company is about 300, about 60 per cent of which is of the 2- and 3½-ton capacity, and the other 40 per cent quite evenly divided among the 1-, 1½- and 5-ton trucks. At the present time the company is driving away about thirty-six trucks a week to Cleveland, Indianapolis and Toledo, the moderate weather facilitating these drive-aways. They report business very good all over the country.

Williams Heads Highway Industries Association

WASHINGTON, D. C., Feb. 18—The Highway Industries Association held a meeting here Saturday and elected the following officers and directors: President, S. N. Williams, sales manager of the Garfield Motor Truck Co.; first vice-president, A. R. Hirst, Wisconsin State Highway Engineer; second vice-president, E. J. Mehren, McGraw-Hill Publishing Co.; third vice-president, S. T. Henry, Allied Construction and Machinery Corporation. Directors include Windsor T. White, White Company, Cleveland, representing the motor truck industry through the N. A. C. C.; William E. Metzger, Columbia Motor Company, representing the motor car industry through the N. A. C. C.; W. O. Rutherford, sales manager B. F. Goodrich Company, representing the Motor and Accessory Manufacturers' Association; A. N. Johnson, Portland Cement Association; W. P. Blair, National Paving Brick Association; A. P. Sandles, National Crushed Stone Association; H. J. Love, National Stone Association; S. J. Morrison, National Association Asphalt Block Manufacturers; E. G. Sutton, National Association, Sand and Gravel Producers, and S. T. Batty, National Association Road Machinery Manufacturers. An executive committee was appointed, including Will-

iams, Hirst, Mehren, Henry, Johnson, Blair, Sandles, White and Rutherford.

The association which now represents industries valued close to three billion dollars and employing 1,500,000 men will now devote its efforts to the location of Washington offices, after which it will get down to active business.

Would Employ Alien Enemies

WASHINGTON, D. C., Feb. 18—A bill now before the Committee on Military Affairs introduced by Congressman Moore of Indiana provides for the employment of all interned enemy aliens either as agricultural laborers or for public highway construction.

New Steel Plant Begins Operation

FULTON, N. Y., Feb. 16—The Heroult electric plant of the Fulton Steel Corp. has begun operations and is turning out alloy steels of different kinds, including nickel chromium, ball bearing, magnet and other steels. One of the chief products will be high-speed tool steel of the Great Bear brand, the invention of Irving R. Valentine, metallurgist of the company, who was formerly connected with the General Electric Co.

Paige May Buy Signal Truck

DETROIT, Feb. 18—The Paige-Detroit Motor Car Co. has made an offer to the Signal Motor Truck Co. to buy its entire business and assets. The offer only awaits ratification of the Signal stockholders, which will probably be given at the meeting to be held about Feb. 20. Owners of the preferred stock of the Signal company would be entitled to the full amount, provided it does not exceed \$106 a share with accrued dividends.

The amount offered has not been made public. C. P. King and W. K. Hoagland, voting trustees of the Signal, say that it would be sufficient to pay all debts and equals the company's sound assets.

Hinkley Making Army Truck Engines

DETROIT, Feb. 18—The Hinkley Motors Corp., which was one of the first local companies to receive a government contract for engines for army trucks, is now filling this order. The capacity of the plant is from 40 to 50 army truck engines a day, and production is gaining rapidly.

Lozier Commissioned a Major

WASHINGTON, Feb. 19—Harry Lozier, former president of Lozier Bros. Co., Cleveland, and founder of the old Lozier Motor Car Co., has been commissioned a major in the Procurement Division of the Ordnance Department.

New Perlman Factory Near Completion

JACKSON, MICH., Feb. 18—Machinery is now being installed in the new building erected by the Perlman Rim Corp. to replace the one destroyed by fire last month, and the building is being rushed to completion. It is expected that everything will be ready for production next week.

Army Truck Service Pooled in France

Major Andrews, Assistant Chief of Motor Transport Section,
Says New Efficiency System Eliminates Waste, Red
Tape and Duplication of Effort

By Allen Sinsheimer

WASHINGTON, D. C., Feb. 15—Contrary to general impression, there is very little cross-country driving necessary in France. Trucks, more trucks and still more trucks are the requirements of the American Expeditionary Forces. Greater standardization by makers of small parts on trucks, combined with more simplicity and less elaborate design, is the demand of our army abroad.

These and many other interesting and important observations were made here to-day by Major Barrett Andrews, assistant chief in charge of operations of the Motor Transport Service under Colonel Francis S. Pope, with the American Expeditionary Forces in France. Major Andrews, serving directly at General Pershing's headquarters, is in this country for a brief stay, giving to army officers here the benefit of the experiences of our army abroad.

Of particular importance is his message that all of the motor service of the American army abroad has been pooled excepting the aviation trucks, and is now entirely under the direction of Brig. Gen. H. F. Rogers, Chief Quartermaster Corps, A. E. F., who operates directly under General Pershing. General Rogers has so organized the motor transport service as to completely eliminate waste, duplication of effort, red tape, and loss of time, and with the result that there is a saving of 15 to 25 per cent of truck service.

For example, under the pooling system, if the trucks of the Engineer Corps are idle, they can under the scheme be used by the artillery for hauling ammunition, or if the trucks of the artillery are idle they may be used by the Quartermaster Corps for carrying supplies, while under the old system whereby each corps controlled its own trucks, they could not be used by the various other divisions without considerable red tape, and frequently not at all.

French Roads in Good Condition

The popular opinion in this country that the roads of France are destroyed and that all driving is across country is entirely untrue, stated Major Andrews. The roads of France are maintained at a very high standard. Old trucks and old truck bodies are used for road work. The Singalese are detailed in crews much like the section gang of the American railroad plan, and are stationed at intervals along the highways.

The trucks carry crushed rock to the stations of the road crews and to other points along the highway, working on certain schedules, and the workers operating usually directly after the roads have been shelled make their repairs

promptly. In some instances they work while under shell fire.

Motor trucks carry supplies and ammunition within 1200 yards of the front line trenches. The preference in motor trucks by the expeditionary forces, as expressed by Major Andrews, is for 3-ton and 5-ton trucks with the regular war body. The reasons are that the



MAJOR BARRETT ANDREWS
Assistant Chief of Motor Transport
Service in France

regular body is more adaptable and under the pooling scheme is really necessary, as the trucks are constantly used for diversified work. And the desire for 3 and 5-ton trucks is expressed by the fact that General Rogers believes it better to have many supplies moving along slowly but steadily rather than the limited supplies that could be hauled by the speedier and smaller trucks. The highways are divided for use so that the trucks take the outside while the passenger cars take the center, and the space is limited, thus further making the less speedy and larger trucks more desirable.

Standardization is found particularly important at every turn. Requirements for the military trucks include power, light traction effort, four speed transmission, great strength of all transmit-

ting members, security by use of double ignition, extra lights with minimum of exposure, bumpers front and rear, means of towing, and in general all qualities that stand for sturdiness and durability.

The advantages of standardization, is the message from across the ocean, are so apparent that no argument should be necessary. It begins with the manufacturer, includes the furnishing of spare parts, making of repairs, familiarity of all concerned with the type.

The advantages in making repairs in the shops and in the fields are incalculable, and the reduction in tonnage required to carry over sets of spare parts for standardized trucks instead of for many different kinds is of the greatest importance in its dimensions.

General Rogers includes in his duties as Chief of Motor Transport Service procurement, maintenance, technical supervision and all repairs, except as applied to aviation trucks. Cars are districted throughout the field according to their make to insure a sort of standardization of parts for each district, thus avoiding the waste that would be created by haphazard distribution of the many different makes of trucks.

Large Supply Depot

The plan of maintenance includes a large supply depot in central France far from the front, where a huge stock of parts is kept, and which is so situated as to have excellent railroad facilities and a large repair shop close by which will be the main repair shop with a capacity of 1200 trucks per month.

Four types of repair shops will operate in all. There will be assembly at the base repair shop, a factory to do work requiring two to three weeks' work at a point nicknamed "Central Park," semi-mobile repair shops operating 15 to 30 miles from the front lines on the jobs requiring several days of work, and the field repair shops working close to the front lines and making adjustable repairs.

Spare parts are distributed on two plans, salvage and exchange. The salvage includes the return of all metal and other material to the big center depot where there will be a salvage department, and the exchange system includes the return wherever possible of damaged and ruined parts such as magnetos before the new parts are issued. Of course this scheme is pliable, working only to insure as much saving as possible and never interfering with the highest efficiency which demands in emergencies the quickest action.

Catalogs have been compiled, one showing the parts peculiar to each make of truck, and the other combining the parts common to all trucks. There are approximately 1800 important common parts. The factory numbers of the special parts have been continued in use in the catalog and thus it is simple to order a part that has been ruined, since all the driver has to do is to use the factory number on the injured part.

All parts are ordered by drivers through the commanding officer of the division, by requisition, but orders is-

sued by General Pershing and General Rogers have eliminated the written requisition at the front, thus doing away with the time lost by the red tape and allowing for prompt work when it is needed.

The majority of the trucks are provided with permanent tops, the drivers being afforded every possible protection by the tops, special windshields and large goggles, because of the dust which has been found extremely thick all through the fighting territory. There are two men, both expert drivers, attached to each truck, and, according to Major Andrews, the drivers of motor trucks are the most popular men in the army, since they are the carriers of food, ammunition, bedding and clothing.

Troops are marched on foot only to an extent necessary to keep them fit and whenever possible are moved from point to point by motor truck. Cooking for troop and truck companies being moved overland is now accomplished in rolling kitchens arranged on trucks.

The difference between the repair work of the French army and the American army, stated Major Andrews, is the difference between hand work and machine work, for the French make the majority of their repairs by hand while the American forces are installing complete mechanical equipment to adequately provide for machinery repair.

All Parts Should Be Standardized

Manufacturers in this country will insure considerably greater efficiency for their products if they will turn out their trucks with as many nuts and bolts and other minor parts standardized as is possible. Tires are causing considerable trouble because of the great variation in sizes. And Major Andrews was particularly emphatic in his request that the makers combine to standardize insofar as possible without necessarily affecting design. Simplicity and strength are the two real requisites.

There are none of the many facilities for caring for trucks abroad that exist in this country. During the cold months the radiators had to be drained daily because there was no anti-freeze solution available and at night no heated garages in which to store the trucks.

Gasoline is used conservatively for cleaning purposes because of its scarcity. All of which is mentioned by Major Andrews to illustrate the vast difference between treatment of the machines abroad and here, which is the important reason why makers should give much consideration to making trucks mainly powerful and simple rather than elaborate.

Major Andrews was particularly emphatic in his praise of the present pooling system in use, stating that "pooling of our trucks, cars and motor supplies was the result of General Pershing and General Rogers, who without any red tape used their sound business judgment, of which they both have abundance and have worked out an organization that will enable us to handle the motor transport service of the expeditionary forces with 25 per cent fewer trucks than

Government Needs 90,000 Men

Must Be Familiar with Motor Vehicle Work—53,124 Chauffeurs Wanted

WASHINGTON, Feb. 15—The government is in urgent need at present of more than 90,000 trained men familiar with motor vehicle work. The members required in a few of the important divisions follow:

Chauffeurs	53,124
Repairmen	30,900
Magneto repairmen	218
Tire repairmen	156
Truck drivers	465
Motorcycle riders	2,534

This represents but a small fraction of the great armies of trained workmen needed for the army. From the electrical trade alone, approximately 22,443 men are required.

There is a demand for approximately 17,000 radio operators, and 5600 commercial engineers, electrical engineers, and chemists. There is need for 29,400 men including metal workers, general machinists, and tool makers. More than 6000 railroad men and 1800 steam engineers, and approximately 14,400 men for wood work and airplane manufacture are required.

would be required if they were not pooled."

Motor trucks drive near the front lines without headlights or sidelights, with drivers smoking cigarettes to serve as guides and warning signals.

The American motor trucks have been found the best by all odds, not only in the American army, but in all divisions of the Allied forces and have, according to Major Andrews, motorized the war.

Forty per cent of the passenger cars used in the army have closed tops owing to the heavy dust and the frequent rains. Officers are not allowed to drive their own cars and operate under orders strictly specifying that officers must be ready for duty at all times and must not engage in such duties as will ruin their uniforms.

Repairs to passenger cars is planned along the same lines as with the trucks. Speed along the main roads through which the passenger cars take the middle course leaving the outside to the trucks is limited to 35 or 40 m.p.h., while in the roads near the front lines speed is prohibited above 20 m.p.h., except in cases of emergency.

Great numbers of trucks are needed abroad. In fact, stated Major Andrews, it is not possible to ship too many trucks as they can be used for so many purposes not now allowed because of the numbers.

Two-wheeled type trailers are giving the best results, but all types of trailers are handicapped, according to Major Andrews, because of inadequate design. He stated that the most urgent need was

for a self-lubricating towing device, and that there would be great demand for trailers so equipped.

Major Andrews will return to France within a few days, carrying back with him complete details and photographs of the new standardized trucks and of the great work accomplished here for motorizing our army. He could not of course reveal any of the numbers of trucks in use nor the number of men in the motor transport service, but stated that much has been accomplished abroad and that he had every confidence in the present conduct of the military activities of the American Expeditionary Forces.

Airplane Mechanics Hard to Get

WASHINGTON, D. C., Feb. 18—The Aviation Service of the Signal Corps finds it difficult to secure suitable airplane mechanics despite the thousands already enrolled. It finds that the average automobile mechanic does not make a good airplane inspector because the work performed on automobile engines is considerably less accurate than on airplanes, the automobile repair training being often a sort of hit or miss system. It was found at one camp that 2500 mechanics enlisted because of automobile training and experience are unsuited to the work. They will probably be transferred to motor truck divisions.

Simplify Export Regulations

WASHINGTON, D. C., Feb. 18—The War Trade Board through the Treasury Department has requested collectors to accept shippers' export declarations in lieu of individual licenses for all goods if it is shown that the goods are covered by a bill of lading marked for export or a through export bill of lading provided the bill of lading is prior to Feb. 20 and the goods actually exported by March 15.

This announcement is made to set at rest the fears of export shippers following the President's import and export proclamations of last week. Goods from warehouses or from points near the point of exit will be allowed for export if it is shown that such goods will be exported by March 1.

After March 1 this latter class of merchandise will require individual export license. After March 15 all goods if to be shipped after March 15 with the bill of lading dated after February 19 will require individual license. The War Trade Board requests shippers exporting goods with bill of lading dated prior to Feb. 20 to file application for export license immediately.

Keep Civilians Out of Airplanes

WASHINGTON, D. C., Feb. 18—New army orders prohibit all persons from riding in army airplanes other than members and employees, Aviation Section, Signal Corps, officers and enlisted men of the army, navy and marine corps and components in active service, heads of executive and judicial branches of the Government, Senators and Representatives and civilian flyers examined for instructor positions.

Return Loads Bureaus a Great Aid

Connecticut Has 14 Bureaus Listing 700 Trucks—How the Plan Is Working Out

NEW YORK, Feb. 19—The State of Connecticut has formed and has in actual operation to-day, fourteen Return Loads Bureaus in as many cities in the state for the purpose of relieving railroad congestion by acquainting all the shippers in the state of concerns or individuals who have motor truck equipment available for the overland haulage of goods.

This was the message brought by William S. Conning, Chairman of the Committee on Motor Truck Transportation of the Connecticut State Council of National Defense, to the Highway Traffic Assn. of the State of New York at a meeting held to-night in the Automobile Club of America.

Connecticut has assumed the leadership in this work for there is no other state in which a similar system of bureaus has been established. The Return Loads Bureau is a means whereby any shipper desiring to move goods between his own city and any other city may immediately get into communication with either motor truck transportation companies or private individuals owning trucks that are available for this work either on a contract basis or by separate loads.

There has been a great need for bureaus of this kind, which are similar to the return load organizations in Great Britain. Particularly since the acute railroad congestion of the past winter there have been great amounts of goods which could not be shipped by railroad. Some of these goods were finished products to be hauled to shipping points to begin their final shipment to destination, while others have been partly-finished products to be hauled between various manufacturing plants, each of which performed some one or two operations on the goods.

Until the formation of the return loads bureaus in Connecticut, the state's manufacturers were at a loss to know what concerns they could call upon to handle these goods over the roads by motor trucks.

The system has proved a very great success and a very great convenience for the many manufacturers of the State of Connecticut, who have thus been able to move many hundreds of thousands of tons of freight since last winter which otherwise could not have been taken from their shipping room platforms.

Perhaps the most important aid which has been rendered has been the fine co-operation extended by Charles J. Bennett, Connecticut Highway Commissioner, in keeping the Connecticut State roads free of snow during the winter months.

While the great State of New York, which ranks first in the number and value of war contracts, has hesitated in keeping its roads open for the delivery of the many million dollars of goods made in the State, Connecticut has kept its main highways cleared of snow so efficiently that farmers in the rural dis-

tricts have complained that they could not run their sleighs over the roads because there was not sufficient snow on them. The cost of this snow removal work has been borne out of the funds collected for licenses for both vehicles and operators, and has been performed by a very efficient equipment of motor truck plows, scrapers, horse teams and an efficient organization of Highway Department workmen.

In explaining the development of the Return Loads Bureau idea, Mr. Conning pointed out that the Chambers of Commerce or War Bureaus in each of the cities has undertaken the work patriotically and has even had its telephone number listed a second time under the heading "Return Loads," so that any truck operator arriving in any city in the state in which one of the bureaus was established could immediately get in touch by merely asking the telephone girl for "Return Loads."

He also brought out the fact that the Return Loads Bureaus' main function has been to get the shippers and transportation concerns together, leaving to themselves all questions as to the rates charged, the reliability of the haulage concern and the responsibility on the part of

More than 700 trucks of 1-ton capacity and over are now listed in the fourteen Return Load Bureaus established in as many Connecticut cities. Those cities which have these bureaus now in actual operation are as follows: Bridgeport, Bristol, Danbury, Greenwich, Hartford, Manchester, Meriden, Middletown, New Britain, New Haven, New London, Norwich, Stamford and Waterbury.

The only city which should have such a bureau and which has not yet put one into operation is Norwalk. The routes between the fourteen cities which have established the bureaus number forty-eight. Each of these numbered routes are drawn up on a large map which is posted in the office of each of the bureaus, so that each bureau may know the routes in other parts of the state over which some of the 700 motor trucks now listed are available for overland haulage.

Furthermore, the head of the bureau in each city knows exactly what trucks are available for any other of the forty-seven routes by means of a master file of the cards listing the available trucks for each route. For instance, the bureau in New Haven knows what trucks are available for haulage work between Danbury and Bridgeport or between Hartford, South Manchester or Norwich.

As practically all of the main highway routes are included in the routes listed by the Return Loads Bureau, the system offers a real network of routes to supply practically every one of the manufacturing centers of the state.

Each motor truck listed is placed on a card with the name and address of the

owner, the size and capacity of the truck, the kind of goods it can most economically haul and the number of the route over which it operates.

All of the trucks which run on any particular route are given the same route number and are kept in a file in which the route numbers are arranged numerically. This is a ready means of reference for any route, since each one of the fourteen bureaus are supplied with a complete list of the trucks available on all routes.

Hale & Kilburn Reorganizes

PHILADELPHIA, Feb. 20—The Hale & Kilburn Co. has been reorganized as the Hale-Kilburn Corp. The new money subscribed will be paid in to-morrow, and the certificates of the new corporation are expected to be ready for delivery by March 1.

Maibohm Motors Earns \$12,294

RACINE, WIS., Feb. 20—The Maibohm Motors Co. shows net earnings of \$12,294.17 for the year ending Dec. 31, 1917, equal to 3 per cent of the outstanding stock. The company now has distributors in 26 states as well as export distributors in Norway, Sweden, Denmark, British West Indies, Australia, New Zealand and Tasmania. The balance sheet follows:

Assets.	
Cash	\$ 15,832.57
Outstanding drafts on cars in transit, accounts receivable, notes receivable.....	18,584.84
Inventories	67,281.46
Deposits on material..	7,071.87
Deferred to operation..	178,225.59
Machinery and equipment	41,345.40
Patterns and designs..	56,247.28
Trade marks and goodwill	50,000.00
	<hr/>
	\$434,589.01
Liabilities.	
Current invoices and accrued payroll	\$ 123.82
Reserve for war tax on sales	348.90
Sales contingent fund..	1,062.12
Dealers' deposits.....	3,050.00
Capital stock issued and outstanding.....	417,710.00
Surplus	12,294.17
	<hr/>
	\$434,589.01

Lack of Transportation Brings Fuel Oil Shortage

NEW YORK, Feb. 20—Another serious fuel shortage is threatening the industries throughout the East. This time it is a shortage of fuel oil, which is extensively used for the propulsion of ships, in power plants and in industrial processes. Lack of transportation facilities is the chief reason for this shortage, for there is sufficient crude oil at the wells. A large amount of the crude from which the fuel oil is made has come in the past by tank steamers from the Mexican and Texas fields, but these steamers have been commandeered by the Government.

On the other hand, the railroad congestion has interfered with the transportation of oil by railroads and it is figured that 63,000 additional tank cars are required to make up for the withdrawal of the tank steamers.

The matter is at present being looked into by the oil division of the Fuel Administration of which M. I. Requa is chief. All consumers have been divided into twelve classes and each class given a priority rating. It is stated that just at present only the first five classes are being supplied. A number of oil men attending the annual convention of the American Institute of Mining Engineers in New York expressed the view that if Mr. Requa were given a free hand he would satisfactorily solve all problems connected with the shortage, as he is a practical oil man.

Truck Relays from Akron to Pittsburgh

AKRON, Feb. 16—The Ohio Forwarding Co. has been formed to haul goods by motor truck between Akron, Youngstown, Newcastle and Pittsburgh. It is expected that 50 5-ton trucks will be purchased first, and that this fleet will be increased gradually to 100, as the business warrants. Regular warehouses will be established at each city.

An innovation will be the use of 5-ton trailers on part of the route to reduce the cost of haulage. Furthermore, the trucks will not run straight through from Akron to Youngstown, but special trucks will be sent from Akron to Youngstown, where the roads are fairly level, others from Youngstown to Newcastle, and still others from Newcastle to Pittsburgh.

Loading will take place in the warehouses, by means of demountable bodies, and will take only 3 or 4 minutes.

Record Crowds at K. C. Show

Truck and Car Exhibitors Well Pleased with Amount of Business Done

KANSAS CITY, Feb. 16—The Kansas City motor car show means more to the Southwest this year than it has ever meant before.

Each night the show has been crowded. To those who came the affair had all the earmarks of the preceding hurrah days of big business and growing sales. The man who thought the show might be a fizzle this year found in it a wonderful object lesson. The effect on the public has been good.

The show is showy. The decorating, by E. W. Campbell of Boston, arranged for by the National Association of Automobile Show Managers, of which Manager E. E. Peake is president, is fine. The show is pretty. The public likes it.

There is an extensive truck exhibit, and all the show publicity lays emphasis upon the business aspect of the passenger car and the economic necessity of the motor truck. The truck exhibitors are well pleased. One big truck deal was made during the show, the Moriarty Motor Co. taking on the Federal.

The show, which for two years has been in the J. I. Case building, is back in Convention Hall. This gives a more showy type of building than the one in the downtown section, but there is about 25 per cent less room. Kansas City, like all other big cities, must solve its show building problem in a permanent way soon. Too many shows have to specu-

late each year as to where the affair will be held. This uncertainty should be removed and a proper auditorium type building of sufficient size erected in some manner. Kansas City is considering the matter. It could use the building for many things and the town's civic pride should make the task one of not great difficulty.

One or two things exemplify what the show has meant to business. One is that the hotels are packed as never before in their histories—and this is not exaggeration. The Muehlebach began turning down reservations for show week Jan. 4.

The show had a better buying crowd than for several years. This is taken to indicate that the public, influenced by Vanderlipian propaganda, had been holding off and came out of its shell under the influence of the show. Several dealers made real show sales.

Quite a few dealer contracts were signed. Dealers who came in from the territory signed up for both cars and trucks. There is no stampede to the low-priced cars, although they, of course, are centers of interest. But there is money in the Southwest and the farmer who has the money is just as keen for a \$2,000 car as his city neighbor.

Branch Officers for N. A. D. A.

ST. LOUIS, Feb. 18—The National Automobile Dealers' Assn. will establish branch offices in St. Louis and Washington, each in charge of an assistant secretary. The Washington office will be in the National Automobile Chamber of Commerce Building.

A legislative committee will be appointed for each state to report to the association on pending bills which affect the selling, making or use of cars.



The Kansas City show drew bigger crowds this year than ever before

Text of the President's Export and Import Proclamation

Following is given the text of the Import proclamation, the export proclamation being identical except for the substitution of the word export for import.

WHEREAS Congress has enacted, and the President has on the sixth day of October, 1917, approved, a law which contains the following provisions:

"Whenever during the present war the President shall find that the public safety so requires and shall make proclamation thereof it shall be unlawful to import into the United States from any country named in such proclamation any article or articles mentioned in such proclamation except at such time or times, and under such regulations or orders, and subject to such limitations and exceptions as the President shall prescribe, until otherwise ordered by the President or by Congress: Provided, however, that no preference shall be given to the ports of one State over those of another."

And whereas the President has heretofore by proclamation dated November 28, 1917, declared certain imports in time of war unlawful, and the President now finds that the public safety requires that such proclamation be amended and supplemented in respect to the articles and countries herein-after mentioned;

Now, therefore, I, Woodrow Wilson, President of the United States of America, do hereby proclaim to all whom it may concern that the public safety requires that the following articles, namely: All kinds of arms, guns, ammunition, and explosives, machines for their manufacture or repair, component parts thereof, materials, or ingredients used in their manufacture, and all articles necessary or convenient for their use; all contrivances for or means of transportation on land or in the water or air, machines used in their manufacture or repair, component parts thereof, materials or ingredients used in their manufacture, and all instruments,

articles, and animals necessary or convenient for their use; all means of communication, tools, implements, instruments, equipment, maps, pictures, papers, and other articles, machines and documents necessary or convenient for carrying on hostile operations; all kinds of fuel, food, foodstuffs, feed, forage, and clothing, and all articles and materials used in their manufacture; all chemicals, drugs, dyestuffs, and tanning materials; cotton, wool, silk, flax, hemp, jute, sisal, and other fibers and manufactures thereof; all earthen, clay, glass, sand, stone, and their products; animals of every kind, and their products and derivatives; hides, skins, and manufactures thereof; all nonedible animal and vegetable products; all machinery, tools, dies, plates, and apparatus, and materials necessary or convenient for their manufacture; medical, surgical, laboratory, and sanitary supplies and equipment; all metals, minerals, mineral oils, ores, and all derivatives and manufactures thereof; paper pulp, books, and all printed matter, and materials necessary and convenient for their manufacture; rubber, gums, rosins, tars, and waxes, their products, derivatives, and substitutes, and all articles containing them; wood and wood manufactures; coffee, cocoa, tea, and spices; wines, spirits, mineral waters and beverages; and all other articles of any kind whatsoever, shall not, on and after the 16th day of February, in the year 1918, be imported into the United States or its territorial possessions from Abyssinia, Afghanistan, Albania, Argentina, Austria-Hungary, Belgium, her colonies, possessions, and protectorates, Bolivia, Brazil, Bulgaria, China, Chile, Colombia, Costa Rica, Cuba, Denmark, her colonies, possessions, and protectorates, Dominican Republic, Ecuador, Egypt,

France, her colonies, possessions, and protectorates, Germany, her colonies, possessions, and protectorates, Great Britain, her colonies, possessions, and protectorates, Greece, Guatemala, Haiti, Honduras, Italy, her colonies, possessions, and protectorates, Japan, Liechtenstein, Liberia, Luxembourg, Mexico, Monaco, Montenegro, Morocco, Nepal, The Netherlands, her colonies, possessions, and protectorates, Nicaragua, Norway, Oman, Panama, Paraguay, Persia, Peru, Portugal, her colonies, possessions, and protectorates, Roumania, Russia, Salvador, San Marino, Serbia, Siam, Spain, her colonies, possessions, and protectorates, Sweden, Switzerland, Turkey, Uruguay, or Venezuela, except under license granted in accordance with regulations or orders, and subject to such limitations and exceptions as have heretofore been, or shall hereafter be, prescribed in pursuance of the powers conferred by said act of October 6, 1917. The said proclamation of November 28, 1917, and paragraph 111 of the Executive order of October 12, 1917, are hereby confirmed and continued and all rules and regulations heretofore made in connection therewith or in pursuance thereof are likewise hereby confirmed and continued and made applicable to this proclamation.

In witness whereof, I have hereunto set my hand and caused the seal of the United States of America to be affixed.

Done in the District of Columbia this 14th day of February, in the year of our Lord one thousand nine hundred and eighteen and of the independence of the United States of America the one hundred and forty-second.

WOODROW WILSON.

By the President:

ROBERT LANSING.

Secretary of State.

No Alarm Over Export-Import Control

(Continued from page 423)

"In restricting motor car exports, the following essential facts should be considered:

"1—A certain amount of tonnage employed to carry needed materials to this country offers outgoing space, part of which should be allotted to the motor car industry, as the third largest manufacturing industry in the country.

"2—Boxed motor cars and trucks are known as measurement cargo, of which each ship must have a certain volume to be properly loaded.

"3—"The motor car industry, having contributed largely in the sacrifices brought out by the war should be allowed to use part of the tonnage not required for war purposes, especially 'on deck' space and space on sailing vessels.

"4—"If any general restrictions in motor car exports are to be made, both past business and pending contracts should be considered when determining the reduction required in the case of each manufacturer.

"5—"These restrictions should be arrived at only after due consideration of these facts: viz., the present output of the more important motor car plants is

limited entirely by transportation facilities, and the use of motor cars for business purposes in Australia, South America and South Africa, which countries are important sources of raw materials needed to win the war, should be encouraged as a war measure to the extent of tonnage available.

"6—"The building up of a trade in motor cars, or any other commodity, in countries outside the United States is a long and tedious business. The only way to hold an export business is to do continuous business. Whereas, in the United States it takes but a few weeks to change dealers, it is a matter of months or even years in the export business before a change of motor car dealers can be satisfactorily worked out.

"7—"To discontinue entirely at this time the selling of American motor cars in export territory would break down and disorganize what it has taken years to build up. It is, therefore, essential, if it can be worked out, to permit the shipment of a quantity of motor cars sufficient to keep relations with dealers alive."

Neither rubber importers nor the tire concerns can see grave consequences as a result of the proclamation. The rubber people have been under government control since last December and it is

thought that these new regulations will not have great effect.

There is at present a sufficient quantity of rubber on hand, including such as is now afloat, to last for 3 or 4 months. There has been no difficulty in securing licenses to date and none is anticipated.

Most of our rubber comes from British possessions in the Orient, 135,000 tons of the 170,000 tons imported in 1917 coming from such sources. In 1917, rubber imports were 43 per cent greater than in 1916. During the year 1917, a total of 333,373,711 lb. was imported and of this 215,146,375 lb. came from British possessions.

During the same period, tires to the value of \$12,330,201 were exported, England being the heaviest buyer with a total of \$2,636,654. Canada was next and France third.

The primary and direct intent of the measure is to increase the tonnage available for the shipment of men, supplies and materials essential in the conduct of the war; it is planned that this shall be done by reducing to the minimum the space allotted for the importation and exportation of raw materials and finished products not immediately essential in the conduct of the war.

Looking on the situation from every angle, it appears distinctly more hope-

ful than harmful. In the last year, the facilities of the United States for the production of ferro-manganese over which there was the greatest apprehension, have very greatly increased so that our iron and steel producers are practically independent of foreign supplies.

The iron and steel people point out that with a restriction of exports—and it is estimated that between 25 and 40 per cent of our current exports of iron and steel including a considerable quantity regularly licensed by the War Trade Board represents material which might be stopped under existing conditions without embarrassing the prosecution of the war—a corresponding increase in the amount of iron and steel will become available for home consumption.

This is dependent, of course, upon the maintenance of production. At the present time, facilities for production are better than ever before. The railroads are in better condition than for some time and the feeling among the pig iron trade is very buoyant.

That there will be a marked curtailment in the shipment of certain varieties of iron and steel, which during the last 6 months have been exported in large quantities, notwithstanding the license requirement, seems certain.

It is expected that when the full weight of the regulatory measure is felt, the benefits to the railroads will be manifold. In other words, instances have been known, where export licenses have been obtained under what might be broadly styled sharp practice and material has been shipped to the seaboard under priority orders which would not have been given otherwise. It seems likely that railroads will refuse to accept shipments regardless of priority orders unless the shipper can give some adequate guarantee that he will be allowed to export the material offered the railroad for transportation.

This probably will prove a part of the silver lining to the cloud. If exports of raw materials and finished products are to be curtailed, and production is to be maintained, this can only mean an increased supply for home consumption. And if the railroads refuse to accept shipments destined to seaboard, without guarantee of an export license, the transportation channels of the country will be cleared of a certain load and better able to care for present requirements.

Nelson Co. to Make Jumbo Trucks

SAGINAW, MICH., Feb. 15—Nelson Brothers Co., of this city, has just formed a separate organization known as the Nelson Motor Truck Co. and has begun the manufacture of a 2½-ton internal-gear-driven truck. It is the intention of the concern to add other sizes to the line.

Klingensmith Denies Ford Price Increase

DETROIT, Feb. 19—Despite the fact that dealers all over the country are advertising an increase in the price of Ford cars after March 1, Frank Klingensmith, treasurer of the Ford Motor Co., denies this.

Tractor Men Need 3,000 Cars

Entire Spring Output Crowded in Factories and Yards Awaiting Shipment

KANSAS CITY, Feb. 18—More than 3000 railroad flat cars are needed right now to move the farm tractors that have been ready for several weeks, and remain in tractor factories, where they are so crowded that all available space within the factory is used. In some factories the stored machines are lined up on the streets in front of the building. So acute has the situation become, that some of the tractor factories will have to close within 10 days, if the goods are not moved. One large tractor maker in Indiana, had only twelve freight cars in the month of January to move his tractors away, and he needed 200.

There is not a tractor factory, which is not being handicapped financially by its inability to ship machines. Even small tractor factories have from \$100,000 to \$200,000 tied up in completed machines that cannot be shipped.

So acute has the car shortage become, that to-day a telegram was forwarded to Secretary McAdoo, asking that consideration be given to tractor makers in the use of railroad cars. There are farmers in southern Texas and other parts of the South who need tractors for farming, but cannot get them. The production of the 1918 crop is already suffering because of lack of machines. Soon the spring will move northward through the great grain belt, and tractors will be needed in increasing quantities. Unless the railroad situation clears up, the spring crop will suffer.

The Avery company, Peoria, has several hundred machines, which have been ready for shipment for a month, crowded into all available storage space in the factory; the yard is filled and street space. Emerson-Brantingham in Minneapolis has its yard filled, and strings of machines on the street in front of the factory.

I*f your copy of AUTOMOTIVE INDUSTRIES does not reach you on the day it usually arrives, wait a day or two before writing about it. It is on the way. These days the railroads are having a hard time and finding it almost impossible to adhere to schedules because of the extraordinary amount of freight which must be handled. Even the United States mails are delayed. The post offices have had hundreds of expert sorters enlist and poor help has taken their places. So wait a few days before you write us that your copy has not been received.—AUTOMOTIVE INDUSTRIES.*

The Minneapolis Steel & Machinery Co., making the Twin City tractor, has its huge factory space filled with completed parts and lacks room for the proper assembly of machines. The Grey Tractor Co. in Minneapolis has its yard filled with tractors crated for France, but lacks railroad facilities to move them.

The Parrett Tractor Co., Chicago, is well situated for shipping and has not suffered to the same extent as others, but has a large quantity of tractors waiting shipment. Rumely, Laporte, Ind., had only twelve freight cars in January and needed more than 200. There is no relief in sight.

Urge Use of Box Cars for Tractor Shipments

MINNEAPOLIS, Feb. 19—Tractor manufacturers and farm implements dealers are pushing a plan to persuade the government to allow their products to be shipped in box cars. At present only grain may be shipped in these cars.

About \$60,000,000 worth of farm machinery must be sent out before April 15, if it is to arrive at the farms in time for use this spring, and the only solution of the problem of transportation, according to the National Implement Manufacturers' Assn., is the use of box cars for shipment.

Maibohm Prices Increased

RACINE, WIS., Feb. 16—The Maibohm Motors Co. will increase the factory prices of all cars shipped after March 15. Two new body styles, four color options and a new upholstery option have been announced.

The price changes are:

Model	New Price	Old Price	Increase
"A" Roadster	\$830	\$795	\$35
"B" 4-passenger Phaeton.....	1050	975	75
"B" Sedan	1650	1375	275

The new styles are a 5-passenger touring body for the Model "B" chassis, to sell for \$1,050, and a two-passenger speedster Model "A" to sell for \$830. The color options include deep maroon, powder blue, tourist khaki and battleship gray. An option of Spanish or black upholstery is now given.

Regal in Receivership

DETROIT, Feb. 19—The Regal Motor Co. has been placed in the hands of a receiver. At a meeting of stockholders held yesterday it was decided to try and resume production in a short time. As soon as an inventory is taken, the creditors will be called together, and it will be decided whether to liquidate or continue. The Securities Trust Co., Detroit, which has been appointed receiver, believes that at the inventory enough assets will be revealed to warrant continued operation.

The assets of the company are \$1,500,000, while the liabilities, exclusive of contingent liabilities, amount to only \$600,000. It is possible that the receiver may buy the business and maintain it until recapitalization is accomplished.

New Automobile Law for Maryland

Tractors Classified as Motor Vehicles—Higher License Fees—New Speed Limit

BALTIMORE, Feb. 19.—Maryland is going to have a new automobile law, which will make a number of sweeping changes in the present law and also provide for many improvements as a protection to the motorists. The entire law has been rewritten and changes introduced to conform with the modern idea. The bill has been introduced into the Senate of the State Legislature and was prepared by E. Austin Baughman in conference with Osborn I. Yellott, counsel for the A.A.A. and the Auto Club of Maryland, and drafted by the state law department.

Provision is made for the abolishing of the horn traps, which are set up in the rural counties. The definition "motor vehicle" has been enlarged to include tractors and traction engines and vehicles with two or more solid tires. The motor Vehicle Commissioner is also given the power to define any disputed cases. No exemption is granted to anyone to use a motor vehicle in Maryland except state, city, counties, towns, or villages, in section 135.

Fees for motor vehicles have been revised as follows: Class A provides a minimum fee of \$10 for pneumatic-tired vehicles instead of \$5; Class B, solid tires, is raised from \$8 to \$12 for vehicles having a rated carrying capacity of not more than 1 ton and the increase is from \$6 to \$9 for each additional ton; Class C, motorcycles, increased from \$3 to \$5; Class D, dealers, to \$25 for the first two sets of tags, an increase of \$5 for each set. Additional sets will cost \$12 each instead of \$10; Class E, motorcycle dealers, increased from \$8 to \$20 for the first four sets of tags and \$5 instead of \$2 for additional tags; Class G (new), trailers, provides \$5 for each ton carrying capacity; Class H (new), tractors and tractor engines, flat charge \$25. Owners must not furnish their own markers.

Section 143 is changed and provides an age limit of 18 years. Persons learning to operate must obtain a permit for \$1, and must also be examined and all future applicants for licenses must be examined. Section 144 provides a fee of \$1 for operators of bicycles with motor attachments and the same fee for operators of tractors and traction engines.

Section 145 gives the commissioner broad powers to suspend registration of any vehicle which is so constructed or operated as to cause unreasonable damage to the public highway. The penalties are increased from a minimum of \$25 to a minimum of \$100 and the maximum of from \$100 to \$1,000 in addition to imprisonment of from not less than 30 days to one year. The law applies to operator and owner alike.

In Section 149 the speed limit of solid tire vehicles weighing 2 tons or less is

reduced to 25 miles maximum, 2 tons and not in excess of 6 tons, 15 miles. Over 6 tons, 12 miles. The existing law allows vehicles over 4 tons and not in excess of 8 tons 15 m.p.h., and those over 8 tons 12 miles. The maximum speed in thickly populated sections for all motor vehicles is 15 miles instead of 12 miles, and outlying sections of communities 18 miles. In the open country reasonable care in the operation of the machine is provided, the driver being the judge in that particular. Penalties for exceeding 60 miles an hour are from \$100 to \$1,000 or imprisonment of not less than 30 days nor more than one year.

Record Crowds at Newark Show

NEWARK, N. J., Feb. 16.—The Tenth Annual Newark Show opened to-night in the First Regiment Armory with record crowds attending. The exhibit is being staged by the New Jersey Automobile Exhibition Co. and there are 186 cars exhibited by 86 dealers.

Goldman Leaves Studebaker Committee

DETROIT, Feb. 18.—Henry Goldman has retired from the executive committee of the Studebaker Corp., but will remain a director of the company. Waddill Catchings, of Goldman, Sachs & Co., will succeed him on the executive committee.

To Teach Soldiers in Sweeney School

KANSAS CITY, Feb. 15.—The Sweeney Automobile School, which has a regular attendance of 2100, has been requested by the government to assist in teaching enlisted men the internal combustion engine, giving them a complete course of the mechanics necessary for automobile, airplane, motor truck and motorcycle.

The facilities of the Sweeney school are perhaps the most complete of any available for this work. At present the attendance of 2100 represents all except two States in the Union. The number of young farmers who are taking courses in mechanics is rapidly increasing. Eleven hundred and two joined the Sweeney school in the month of January. Seven hundred and ninety-six joined in December and the enrollment in February to date is greater than that for the entire month a year ago. The school is running in two shifts at the present time, and the present building, which was occupied some months ago, is not large enough and an addition to increase the capacity one-third is being started.

Canada Buys Ford Tractors

MONTREAL, Feb. 18.—The shortage of farm laborers in the Canadian Northwest has caused the Dominion government to help the farmers. A thousand Ford tractors have been purchased, and an option secured on another thousand. These will be sold to farmers at cost plus freight charges, at an average of \$800. The Ford company cannot begin delivery before the end of March.

Delay 1918 Tractor Demonstration

Uncertainty of Shipments and Railroad Congestion Cause of Postponement

KANSAS CITY, Feb. 18.—The question of definite arrangements for the 1918 tractor demonstrations by the National Implement and Vehicle Assn. has been delayed by the committee which has this work in charge. The committee held a meeting here to-day and decided that because of the congested conditions of the railroads and the uncertainty of securing adequate railroad equipment for shipping tractors, it was impossible to decide definitely on any demonstration. No time nor place for holding such demonstration has been selected yet, although it has been decided to hold a tractor demonstration under rigid rules so that complete information regarding the performances of the different machines can be had and an official report published. If conditions change, and demonstrations are possible they will be held.

It is certain that the demonstrations will not go to Fremont, Neb., this year as they have in past years. Cleveland has been discussed as a probable center for the demonstrations, but it is very questionable if sufficient land can be secured for plowing.

A delegation from Salina, Kan., an enterprising city in the western part of the state, advanced the claims of that area for the tractor demonstrations. It is also understood that some centers of Dakota are anxious to secure the demonstrations. It has been suggested that these demonstrations go to the Twin Cities, but the ground is a little rough and hilly, and it is questionable if necessary acreage could be obtained.

Miller Rubber Earns \$831,271

AKRON, Feb. 18.—Net earnings of \$831,271 during 1917 were reported at the annual stockholders' meeting of the Miller Rubber Company held recently. A contemplated stock dividend was passed. The following directors were elected: Jacob S. Pfeiffer, William F. Pfeiffer, Frank B. Theiss, C. T. Grant, and J. M. Doran. Jacob S. Pfeiffer was re-elected president, C. T. Grant vice-president, William F. Pfeiffer, secretary and general manager, and Frank B. Theiss, treasurer.

Cutting-Larson Adds Trucks

NEW YORK, Feb. 18.—The Cutting-Larson Co., Oldsmobile distributor is to handle two lines of trucks and will distribute them over a considerable territory, including New York and the New England States. These are the Master, produced by Master Trucks, Inc., Chicago, and the Bessemer, made by the Bessemer Motor Truck Co., Grove City, Pa.

Buda Exhibits New Tractor Engine

4-Cylinder Kerosene Burning Model—Making 85 Daily at Illinois Factory

CHICAGO, Feb. 18—The Buda Co. exhibited last week at the Kansas City tractor show its new tractor engine designed especially to handle kerosene fuels. The engine is being used in the latest model of Parrett tractor.

The new job model HTU is a Buda design in nearly all particulars, but incorporates a detachable cylinder head, the first design of this kind to come from Buda. This makes it possible to have engines of different compression for high altitude plowing and also admits of many other good features in construction, such as ample waterjacket spaces in the head, more efficient production of castings, and greater ease in removing carbon.

The engine, a 4-cylinder, L-head block, $4\frac{1}{2}$ by $5\frac{1}{2}$, rated at 32 hp. at 1100 r.p.m., has provision on one front motor arm for an electric generator, and on one rear motor arm for an engine starter. Provision is also made for governor mounting.

To make the use of kerosene more efficient, the spark plugs mounted in the cylinder head are specially water-jacketed; the waterjackets extend $1\frac{1}{2}$ in. lower on the cylinder walls than usual; the pistons are a looser fit; they have cross ribs on the under face of the head to aid in heat radiation; the flywheel is nearly double the weight used in former models of the same size; and the crankshaft bearing area is one-third greater, and the crankshaft approximately 25 per cent stronger than former models with the same piston displacement.

A complete pressure oil system and a cold compression of 65 pounds are used. The engine oil pan is made in two parts, so that the crankcase is really in 3 pieces with horizontal divisions separating them. The object is to have the bottom part removable without interfering

with the bell housing which encloses the flywheel. It also provides greater accessibility.

The Buda factory in Harvey, a suburb of Chicago, is turning out 85 engines of different models a day, and an addition is being erected to increase capacity. Last fall the company instituted the policy of building only 4-cylinder engines for truck and tractor uses.

\$50,000,000 for Tanks

WASHINGTON, D. C., Feb. 18—It became known to-day that fifty million dollars has been appropriated for the purchase of tractor tanks ranging from 12 hp. to 125 hp. The tanks which will be ordered have already been tested by officers of the American and the Allied armies.

New Tractor Engine Developed by Erd Co.

SAGINAW, MICH., Feb. 16—A new Erd tractor engine has been developed by the Erd Motor Co., which will be in production by May or June. The company is erecting a factory addition 404 x 121 ft. that will add 48,000 sq. ft. of floor-space.

This new engine, a 4-cylinder, vertical block design, has the valves carried in the detachable cylinder heads, and the cylinders, $4\frac{1}{4}$ x 6, are water-jacketed their entire length. The spark plugs are set in a water-jacketed part of the wall. Complete provision is made for fitting starting and lighting equipment and the engine intended for burning kerosene is made robust throughout.

Special attention is given in the pressure oil system, including crankshaft, camshaft and piston pin bearings with oil delivered by pump to the rocker arm for the valves. Specially large bearings are used, the crankshaft bearings being $2\frac{1}{2}$ in. in diameter and the three bearings having a total length of $13\frac{1}{2}$ in.

\$277,732,300 for Airplane Bombs

WASHINGTON, D. C., Feb. 18—A bill before Congress calls for appropriation of \$277,732,300 for bombs for airplanes.

Doubles Freight Car Capacity

Minneapolis Company Gets Cars in Parts and Assembles Them in Warehouse

MINNEAPOLIS, Feb. 19—A good example of making one railroad car do what two and one-half previously have been needed to do is found in the Pence Automobile Co., Buick distributor for the four states of Minnesota, North Dakota, South Dakota, and Montana, a territory of approximately 400,000 square miles, or an area practically six times as large as the Boston distributors have in all of the six New England states put together.

Beginning as far back as April, 1917, H. E. Pence discovered that he could not get enough automobiles for his 450 dealers if he relied on shipments by railroad cars, and so decided to begin the assembly of cars in a three-story warehouse that he had in Minneapolis.

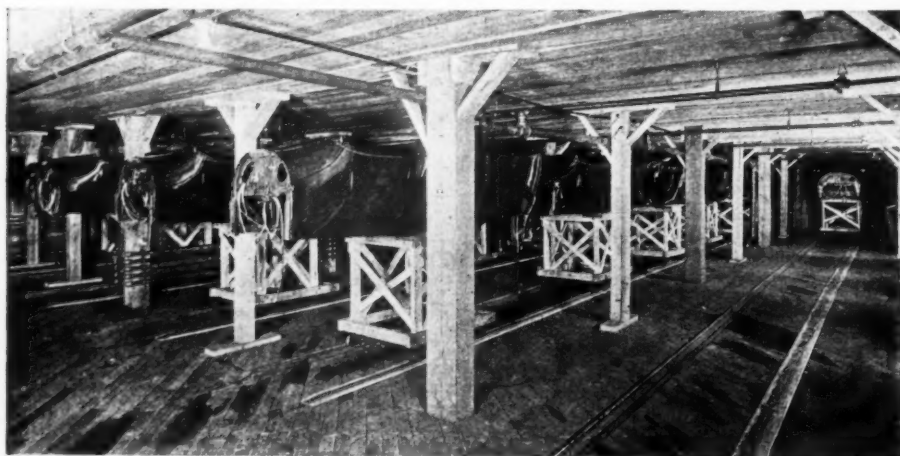
This assembly program was carried along slowly, until July, when the 1918 lines started coming through and since then Pence has assembled 2800 Buicks and in the same time has only received 450 by railroad shipments from Flint.

The railroad economy effected by assembling here is indicated by the fact that it is possible to ship the parts for ten Buicks in one 36-ft., small-door railroad car, whereas it was possible to ship only four Buicks in a 40-ft. special railroad car. It is a case of ten cars instead of four in a small railroad car, too small for carrying complete motor cars.

The Pence assembly work is carried on in a three-story brick building 150 by 222 ft. Here twenty-five Buicks per day are assembled by 80 to 100 workmen and when work is at the peak it will be possible to assemble forty cars per day. This warehouse has been converted into a real assembly factory, with special channel metal tracks along the assembly floor to guide the small hand trucks on which the chassis rests while it is progressing along the assembly floor.

The chassis rests on these trucks when it leaves the assembly floor to enter the steam washroom, where all grit and dirt are removed before the chassis pass into the spray paint room where the painting is done, identically as it would be in the factory. From this paint floor the chassis moves into a long three-track drying oven which has capacity for thirty-nine painted chassis at one time. It is a long wood oven, in which atmospheric pressure is used, but provision is being made to use higher temperatures to speed up drying.

On the chassis assembly floor are many other assembly conveniences, such as overhead cranes to pick up the frame and hold it while axles are being fitted, and to turn the frame over and mount it on the assembly truck. There is another crane which swings the engine unit into place at one point on the assembly track.



Factory assembly methods are used by the Pence Automobile Co., Minneapolis Buick distributor. Since last July, 2800 cars have been assembled

Convenient storage spaces are provided for all parts that enter into the chassis as it progresses.

At present only two models are assembled, the small six and the four-cylinder model and these only in touring car models. Runabouts are not assembled, as it would complicate the stock of parts to be carried and generally render the system more complex. The bodies for the sixes are received in unfinished state and the 450 Pence dealers can secure color options, which were impossible from the Flint factory. This aids very materially in the selling of cars by dealers.

Pence aims constantly to carry on hand parts for two weeks' assembly, which is 300 cars. The shipments from the factory are made in units of 80 six-cylinder cars and 120 four-cylinder jobs. In shipping this material carloads of motors are made up, forty to a car load. Twenty-four bodies are loaded into one car. Other car loads are made up of frames, and others of miscellaneous parts. Everything comes from Flint, with the possible exception of frames, which are shipped direct from the frame factory in Milwaukee.

Of the 100 workmen not one was brought from the Buick factory. There was no difficulty in obtaining workmen in the Twin Cities. They are paid on piece work, and each man has a certain part to do in the assembly chain. If one workman gets behind he holds the line of assembly up, but the operations are so timed that except with a green workman there is no delay. The piece-work plan encourages co-operation among the men and if one workman gets behind, due to breaking of a small part, the others assist him, rather than delay the entire assembly line.

Factory loading and unloading facilities are provided in four railroad spur extensions which are alongside of the factory. There are two loading and two unloading spurs with platforms and all necessary equipment. In the entire assembly scheme nothing is lacking, and the job bears the imprint of permanency. Already some other Buick distributors have become interested in the scheme, and it promises to make progress.

Shipping Board Calls for Workers

Several Hundred Thousand Men Needed to Produce Fleet for Food Transportation

WASHINGTON, Feb. 18—The U. S. Shipping Board needs men. Although the immediate requirements have been filled, according to Secretary of Labor William B. Wilson, who last week said that there was no pressing present demand, it is stated that next month there will be an urgent need for several hundred thousand men to work in producing the fleet of ships which is to be used in transporting American muscle and American food for the aid of America's allies.

It is urged that mechanics enroll at once with the nearest agent of the U. S. Public Service Reserve of the Labor Department or with the local enrollment agent of the various State Councils of National Defense. They are instructed to retain their present positions after enrolling until they are notified when and where to apply for work. Chairman Edward N. Hurley of the U. S. Shipping Board, who is also president of the Emergency Fleet Corp., says, "We will require 250,000 skilled mechanics to help the other loyal men now in the yards to build ships so fast that supplies can be furnished to our boys in the trenches who are making the supreme sacrifice for their country."

Men who have had experience in the following lines are particularly needed:

Acetylene and electrical welders	Loftsmen
Asbestos workers	Template makers
Blacksmiths	Machinists and machine hands, all sorts
Anglesmiths	Helpers
Drop-forge men	Painters
Flange turners	Plumbers and pipe fitters
Furnace men	Sheet-metal workers
Boiler makers	Coppersmiths
Riveters	Shipfitters
Reamers	Structural iron workers
Carpenters	Riveters
Ship carpenters	Erectors
Dock builders	Bolters up
Chippers and calkers	Other trades
Electrical workers	Cementers
Electricians	Crane men
Wiremen	
Crane operators	
Foundry workers	
Laborers, all kinds	

Another Truck Train Bound for Seaboard

BUFFALO, N. Y., Feb. 18—A convoy of about sixty-five military trucks built by the Pierce-Arrow company for the government will leave Buffalo this week for the Atlantic seaboard. The trucks will be driven by men of the Fourth Supply Train from Camp Greene, N. C., with Captain Jack L. Meyer, quartermaster, in charge. There will be 164 men and six officers in the organization.

Standardization in Factory Buildings

(Continued from page 409)

in any number of bays, each 30 by 20 ft. in dimension.

Nos. 5, 6 and 7 are similar, except as to the width of the center aisles, and are suitable for forge shops and foundries.

No. 8 is a multi-story mill type which can be made in any multiple of 16 by 20 ft., and though it is most often built with four stories and basement, it can carry additional stories if desired.

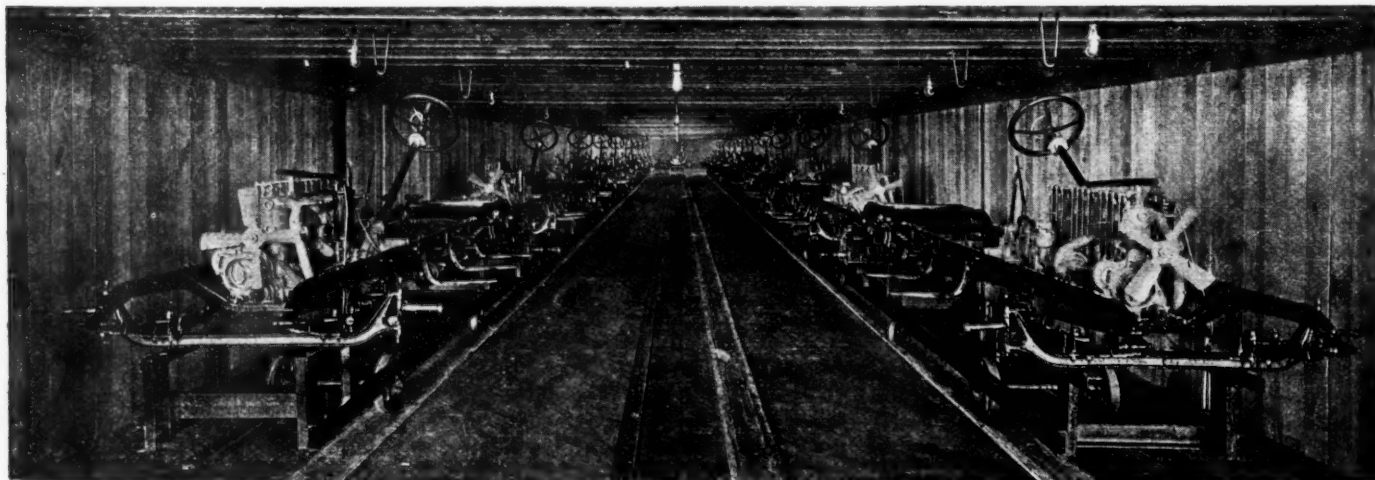
No. 9 is a reinforced concrete multi-story type which can be any multiple of 20 ft. square. A 20 by 20-ft. panel is generally accepted as the most economical in flat slab design, requiring for a given load the minimum of reinforcing steel per square foot.

An example of standardized roof construction is found on the No. 4 type plant for the Nordyke & Marmon Co. at Indianapolis. Pyrobar or gypsum tile was used in 10 ft. length of this structure. The 10-ft. idea meant economy in steel roofing supports. This tile is fire-proof, fume-proof and non-condensing, and it affords excellent reflection of light from its white surface.

The Nordyke & Marmon building is 300 ft. square and was constructed with 10 ft. of saw-tooth roof sash every 30 ft.

George Batten Dies

NEW YORK, Feb. 17—George Batten, president of the George Batten Co., died yesterday. He organized the company in 1891, and had been one of the main factors in its development.



For chassis assembly work, the Pence Automobile Co., Minneapolis, Buick distributor, uses a moving platform where every workman has a certain duty to perform

Men of the Industry

*Changes in Personnel and
Position*

Three Reo Men Added to Mitchell Company

RACINE, Feb. 18—Three well-known men have been added to the roster of the Mitchell Motors Co. These are: C. W. McDowell, who has been made superintendent of the Four Wheel Drive Division. He was formerly general superintendent of the Reo Motor Truck Co. George W. Kerr, who has been made manager and superintendent of the body plants of the company, was formerly in charge of similar work for the Reo company. C. W. Arthur, who has been made special traveling representative of the company, was also formerly with the Reo company.

Bob Lacey has been appointed general sales manager of the Premier Electric Co., Chicago.

James A. Harris, Jr., for many years advertising manager of the White Co., Cleveland, has been commissioned a captain in the Quartermaster Corps. He has been assigned to Mechanical Repair Shop Unit No. 305. Millard H. Newton will succeed him in the White Co.

Charles Oostdyke has been appointed director of purchases for the Hudson Motor Car Co., Detroit, succeeding A. Barrett. He was formerly purchasing director of the Cadillac Motor Car Co. and later a manufacturers' agent.

K. B. MacDonald has been elected vice-president of the Curtiss Engineering Corp., Garden City, N. Y. He was formerly vice-president of the Curtiss Aeroplane & Motors Corp.

N. J. Clausen has joined the Curtiss Engineering Corp., Garden City, N. Y. He was formerly a draftsman with the Otis Elevator Co.

S. R. Bennett has been promoted to the position of supervisor of the testing departments of the Bosch Magneto Co. He was formerly assistant supervisor.

Frank H. Smith has joined the sales forces of the Harry Newman-Stratton Co., Maxwell and Chalmers distributor in Chicago, where he will act as special sales representative in the wholesale department. He formerly was special traveling sales representative for the Studebaker, Lozier, Chalmers and Hal companies.

Clark H. Tenant, for many years associated with the iron and steel industry in Milwaukee, has been appointed assist-

ant superintendent of the ordnance plant established at East Moline, Ill., by the Root & Vandevort Co.

George N. Graham has been appointed general works manager of the Boone Tire & Rubber Co. He will have charge of both the Chippewa Falls, Wis., and the Sycamore, Ill., factories.

J. M. Homs, manager of foreign sales of the Four Wheel Drive Automobile Co., Clintonville, Wis., has resigned to engage in the exporting business in New York. C. S. Thompson will succeed him.

F. C. Seeger has been appointed Michigan representative of the Doehler Die-Casting Co., Brooklyn, with headquarters in Detroit.

S. E. Knauss has been promoted to the position of assistant-to-the-president of the Harry Newman-Stratton Co., Chicago. He was formerly wholesale representative.

M. L. Heminway, formerly sales manager of the Davidson Rubber Co., Boston, has been appointed secretary of the War Service Committee of the Rubber Industry of the U. S. A. His office will be with the Rubber Assn. of America, Inc., 17 Battery Place, New York.

Norman G. Wilson has been appointed sales manager of the Philadelphia branch of the Stanley Motor Carriage Co. For the last 2 years he has been in charge of the Bethlehem, Pa., branch of the Packard Motor Car Co.

W. H. Oliver, Jr., is now connected with the Taft-Pierce Mfg. Co., Woonsocket, R. I. He was formerly chief engineer of the Hyatt Roller Bearing Co. and recently with the Russel Motor Axle Co.

C. W. Price, president of the Auto Devices Co., St. Louis, has resigned, and will head the sales department of the Osgood Lens & Supply Co., Chicago. He will succeed A. C. Fach.

O. R. Hardwell, formerly advertising manager of the Chalmers Motor Co., now has Iowa territory for the Willys-Overland Co., for which he is special sales representative.

Flechter Co. Appoints Detroit Men

DETROIT, Feb. 15—George K. Parsons has been appointed manager of the Detroit office opened by L. V. Flechter & Co. Frank M. Eldridge, formerly of the Wallace C. Hood Service Bureau, is advertising and publicity manager.

R. E. Mills Dies

BLOOMFIELD, N. J., Feb. 18—R. E. Mills, treasurer of the Rajah Auto Supply Co., died suddenly at his home in Montclair, Friday, Feb. 15. It was Mr. Mills who, with his brother, E. B. Mills, founded the present Rajah company seventeen years ago. Mr. Mills was buried at his old home in Canada.

New Companies Formed

*Latest additions to ranks of
Automotive Industries*

Marvel Tractor Co. Ready to Incorporate

COLUMBUS, OHIO, Feb. 18—The Marvel Tractor Co., which has been doing business at 70 North High Street, will be incorporated soon and plans are now being prepared for the erection of a new factory. The Marvel Tractor has been exhaustively tried and found to be successful in many kinds of farm work. For the time being the tractors are being manufactured at the plant of the Jaeger Machine Co., Dublin Avenue.

COLUMBUS, OHIO, Feb. 18—J. A. Baker has organized the Baker Automobile Top Co., which has opened a factory at Poplar and High Streets for the manufacture of several kinds of automobile tops. Associated with him are W. L. Moehl and John Windnagel, Columbus.

NEWARK, Feb. 18—The Hammered Piston Ring Co., which was recently incorporated in Maryland with a capital of \$1,400,000, has purchased the plant of the American Piston Ring Co. of New Jersey.

OSHKOSH, WIS., Feb. 18—The Wisconsin Duplex Auto Co., organized a year ago with \$500,000 capital by William A. Besserdich, one of the original members of the present Four Wheel Drive Automobile Co., Clintonville, Wis., has completed all details of its organization as an Oshkosh concern. At the annual meeting held here the board of directors was reorganized to give Oshkosh capital full representation. Officers were elected as follows: President W. A. Besserdich; vice-president, H. F. Landeck; secretary, B. A. Mosling; treasurer, J. P. Mosling; director, W. G. Maxcy.

The company has taken over the plant of the J. L. Clark Carriage Co., Oshkosh, and will install new machinery and equipment at once. It will concentrate on a 1-ton truck chassis employing an improved quadruple drive transmission system designed and patented by Besserdich. Arrangements are being made to have the chassis in production by March 15 or April 1.

Clyde Cars Earns \$41,259

CLYDE, OHIO, Feb. 16—The Clyde Cars Co., manufacturer of the Clydesdale motor trucks, had sales of \$1,331,045.91 during 1917. After deducting costs, expenses and taxes, a balance of \$41,259.64 was carried to the surplus account. A stock dividend of 12 per cent was declared to stock of record Feb. 4.

Wire Wheel Corp. Gets \$650,000 Shell Contract

NEW YORK, Feb. 18—The Wire Wheel Corp. of America has received a government contract for machining shells aggregating \$650,000. Under the terms of the contract, there will be no outlay required for material, as the government will furnish and deliver forgings to the plants. This work will be done at the company's Springfield factory, while the Buffalo plant will take care of the wire wheel business.

Earnings of the company, for the first 4 months after its organization in November, 1916, averaged \$100,000 a month, but for the eight months from April to November, 1917, averaged only \$69,050, the total for the period being \$552,407.

24,000,000 Champion Plugs in 1917

TOLEDO, Feb. 16—The Champion Spark Plug Co. manufactured 24,000,000 spark plugs during 1917. This is 4,000,000 more than the goal set by the company at the beginning of the year. December was the most productive month with a total of 2,500,000 plugs.

The company intends doubling its capacity during 1918.

Boone Factories Finished

CHIPPEWA FALLS, WIS., Feb. 18—The new factory buildings of the Boone Tire & Rubber Co. have been completed, but delays in delivery of equipment make capacity operation impossible for the time being.

Falls Motors Gets Government Contract

SHEBOYGAN FALLS, WIS., Feb. 18—The Falls Motors Corp. has received a government contract for 2000 motive power units for military trucks, deliveries to begin early in March. On completion of the order, additional contracts will be placed, which will require the operation of the plant at maximum capacity until the summer of 1919. It is stated that the initial lot of 2000 motors will be shipped to the Kissel Motor Car Co., Hartford, Wis., for use in the government military trucks.

The Falls Co. is now filling a government contract, received some time ago, for cylinders and other parts for 5000 Curtiss airplane engines.

Sanford Truck to Increase Capacity

SYRACUSE, Feb. 18—At the annual meeting of the directors of the Sanford Motor Truck Co. it was decided to erect a plant addition which will increase the floor space 50 per cent. This is made necessary by the increase in business, unfilled orders at present amounting to \$270,000. The capital will be increased by the addition of \$100,000 in cash.

Wagon Co. in Troy, Ohio

TROY, OHIO, Feb. 18—In an item which appeared some time ago in AUTOMOTIVE INDUSTRIES it was stated that the Troy Wagon Co. of Piqua, Ohio, had received a contract from the French Gov-

Current News of Factories

*Notes of New Plants—Old
Ones Enlarged*

ernment for automobile trailers, etc. The Troy company is located in Troy, Ohio, and not in Piqua as was incorrectly stated.

Redwood City Plant for U. S. Aircraft

REDWOOD CITY, CAL., Feb. 18—The United States Aircraft Corp., San Francisco, has bought the plant of the Christopherson Aircraft Co. Extensive improvements will be made and the capacity doubled.

New Building for Motor Parts Co.

PHILADELPHIA, Feb. 16—The Motor Parts Co. has moved to a new building at 847 Broad Street, with 25,000 sq. ft. of floorspace. The company recently added an export department to its regular accessories business.

To Make 1400 Cars in February

OAKLAND, CAL., Feb. 18—The Chevrolet Co. of California estimates that it will turn out approximately 1400 cars this month. At the beginning of the month there was a total of 1500 cars on order. The company will spend about \$1,000,000 in additions and improvements to the present plant.

DIVIDENDS DECLARED

The Republic Rubber Co. has declared the regular quarterly dividend of 1½ per cent on preferred stock, payable April 1, to stockholders of record March 9.

The Michigan Stamping Co. has declared the regular monthly dividend of 1 per cent payable March 1 to stock of record Feb. 15.

The Four Wheel Drive Automobile Co. has declared a stock dividend of 50 per cent. The capital will be increased from \$1,000,000 to \$1,500,000 at once.

Capital Increases

MILWAUKEE, Feb. 18—The Clum Mfg. Co., manufacturing motor car and electrical specialties, stampings, etc., has increased its capital stock from \$10,000 to \$100,000 to accommodate its increased business and provide for expansion. The plant is located at 23-27 Erie Street. Arthur Denniston is president.

NEW YORK, Feb. 18—The Hurlburt Motor Truck Co. is issuing \$500,000 worth of 3-year 7 per cent sinking fund gold notes to provide additional working capital. The Hurlburt schedule for 1918 provides for the manufacture of 1800 trucks.

New Reliance Factory Being Built at Appleton

APPLETON, WIS., Feb. 18—The Reliance Motor Truck Co., formerly the Racine Motor Truck Co., Racine, broke ground to-day for the first unit of its new motor truck manufacturing plant, to be 75 x 300 ft. in size, of brick, steel and concrete construction, one story high. The building alone will cost about \$30,000 and the equipment an additional \$25,000. Contracts call for the completion of construction work on May 15.

Metz Concentrates on Government Work

WALTHAM, MASS., Feb. 18—The Metz Co. has sold two of its buildings and will concentrate much of its activities on government contracts in a new building which has just been erected. Although the company will curtail materially its output of cars, it plans to maintain a service of supplying parts for all Metz cars now in use or to be produced for the present season.

Piston Ring Insures Employees

MUSKEGON, Feb. 16—The Piston Ring Co. has arranged with the Aetna Life Insurance Co. to take out life insurance covering the 350 men in its employ. Every man will be insured for \$500, regardless of the length of time he has been with the company, and \$100 will be added annually until the maximum of \$1,000 is reached. The company will pay all premiums. When a man leaves or is discharged, the policy will be cancelled. A \$500 policy will be given to each new employee.

Flechter to Establish Carbureter Service

LONG ISLAND CITY, N. Y., Feb. 18—L. V. Flechter & Co. is planning to establish service stations for their carbureters in all the large cities of the United States. The Neptune Motor Co., of Chicago, Cincinnati, Portland and Los Angeles; Alex Brunner & Son, Newark, N. J., and Burts Supply Agency, Atlantic City, N. J., have already been named to handle service in their respective districts.

Omaha Factory for Britson Mfg. Co.

OMAHA, Feb. 16—The Britson Mfg. Co. has purchased a 6½-acre site here and will start the erection of a tire factory and reclaiming plant. There are several buildings on the site, which will be used for storehouses. The company formerly had a factory at Brookings, S. D.

Western Rope Buys Mueller Foundry

MILWAUKEE, Feb. 18—The Western Rope & Mfg. Co. with home offices at Tulsa, Okla., and a factory here, has bought the Mueller Foundry Co., Cedarburg, Wis., and will enlarge the plant immediately. The Western company, which manufactures gas engines and apparatus for oil wells, has for some time been buying the entire output of the Mueller foundry.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Domestic Fuel Demand Becomes Less Urgent

The let-up in the urgent demand for domestic fuel has enabled a partial increase in the filling of industrial requirements in some quarters, though conditions in New England are far from favorable. There is still a great scarcity of steam grades, and cities in the interior are in a bad way for fuel, principally anthracite.

The use of bituminous coal has been advocated in many quarters where formerly anthracite had been burned. Some municipalities have practically suspended their smoke ordinances for the time being, the authorities evidently taking the broad viewpoint that it is better to have a little smoke and some heat rather than compel their industries to shut down and their citizens to freeze.

The general freight situation is showing signs of improvement, and another cause for congratulation is that there are not many supply ships being delayed in New York harbor for lack of fuel.

Inadequate car supply, as ever, is the one bugaboo that the operators do not seem to be able to overcome. The United States Geological Survey shows that during the week of Jan. 26 production for the country as a whole amounted to 66.1 per cent of capacity; and the one dominant factor limiting production is car supply. To this cause were ascribed losses amounting to 26.6

A New Service

Herewith AUTOMOTIVE INDUSTRIES supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

per cent of full-time capacity, as against 7.3 per cent for all other causes combined.

Speaking of this order, now a thing of the past, it is universally acknowledged that though it saved little fuel, it helped considerably to relieve freight congestion. No less a person than Secretary McAdoo was against a continuance of the measure, as he feared that to adhere to the plan would seriously affect the taking up of the next Liberty loan.

Dr. Garfield states that there will be no necessity for the shutting down of industry in the future, as he believes it possible henceforth to rely upon embargoes and the preference in the movement of food and fuel.—*Coal Age*.

McClaren President of Ajax Rubber Co.

NEW YORK, Feb. 16—H. L. McLaren was elected president of the Ajax Rubber Co. at the annual meeting Wednesday. He is also president of the Racine Rubber Co., Racine, Wis., which is affiliated with the Ajax company. Fred E. Dayton was elected secretary and Stuart Webster vice-president. The retiring directors were re-elected for 3 years, and L. T. Vance and Louis C. Detribats will continue as vice-presidents. Harold W. Stimpson was re-elected treasurer.

The regular quarterly dividend of \$1.25 a share, payable March 15, was declared at the meeting.

Benoist Equips Temporary Plant

CANTON, OHIO, Feb. 18—The Benoist Aeroplane Co. will not build its new plant before next spring. In the meantime a temporary building is being equipped here.

2918 Federal Trucks in 1917

DETROIT, Feb. 18—The Federal Motor Truck Co. manufactured 2918 trucks valued at \$6,005,000 in 1917, compared with 2442 valued at \$4,261,000 in 1916. At present there are unfilled orders on the books which will total \$4,000,000, consisting of 300 foreign orders, 1100

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'gs
*Ajax Rubber Co.	52	55	+2
*J. I. Case T. M. Co. pfd.	84	86	—4
Chalmers Motor Co. com.	6	8	+3
Chalmers Motor Co. pfd.	25	40	..
*Chandler Motor Co.	80	84	..
Chevrolet Motor Co.	118	121	+1
*Fisher Body Corp. com.	26	35	..
*Fisher Body Corp. pfd.	75	85	..
Fisk Rubber Co. com.	51	55	+1
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	96	98	— ½
Firestone Tire & Rubber Co. pfd.	96	99	+1 ½
*General Motors Co. com.	130	134	—5
*General Motors Co. pfd.	83	85	..
*B. F. Goodrich Co. com.	46	47	—1 ½
*B. F. Goodrich Co. pfd.	93	100	..
Goodyear Tire & Rubber Co. com.	143	145	..
Goodyear Tire & Rubber Co. pfd.	99	101	..
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	2 ¾	3 ¾	+ ½
Hupp Motor Car Corp. pfd.	75	80	..
International Motor Co. com.	14	17	..
International Motor Co. 1st pfd.	40	45	..
International Motor Co. 2nd pfd.	17	20	..
*Kelly-Springfield Tire Co. com.	44	47	— ½
*Kelly-Springfield Tire Co. 1st pfd.	75	81	—4
*Lee Rubber & Tire Corp.	13	15	+1
*Maxwell Motor Co., Inc., com.	28	29	—1 ¾
*Maxwell Motor Co., Inc., 1st pfd.	61	64	—1 ¾
*Maxwell Motor Co., Inc., 2nd pfd.	22	24	..
Miller Rubber Co. com.	140	150	—10
Miller Rubber Co. pfd.	95	98	+1
Packard Motor Car Co. com.	98	103	—12
Packard Motor Car Co. pfd.	91	94	..
Paige-Detroit Motor Car Co.	18	19	..
Peerless Truck & Motor Corp.	18	18 ½	—1 ½
Portage Rubber Co. com.	112	114	—1
Regal Motor Car Co. pfd.	..	..	..
*Regal Motor Car Co.	17	18 ½	+ ½
*Saxon Motor Car Corp.	9	11	+ ½
Springfield Body Corp. com.	..	..	..

	Bid	Asked	Net Ch'gs
Springfield Body Corp. pfd.	..	10 ½	..
Standard Motor Construction Co.	..	69 ½	— ½
Standard Parts Co.	..	59	+6 ½
*Stewart-Warner Speed. Corp.	56 ½	52	+1
*Studebaker Corp. com.	50 ½	52	+1
*Studebaker Corp. pfd.	91 ½	97	—2
Swinehart Tire & Rubber Co.	..	37	..
United Motors Corp.	24 ½	25	— ¾
*U. S. Rubber Co. com.	57	58 ½	+1
*U. S. Rubber Co. pfd.	99	101	..
*White Motor Co.	43	44	+1
*Willys-Overland Co. com.	18 ½	19 ½	+ ¾
*Willys-Overland Co. pfd.	79	80	+1

*At close Feb. 16, 1918. Listed N. Y. Stock Exchange.

†Par \$10 per share.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE ACTIVE STOCKS

	Bid	Asked	Net Ch'gs
Auto Body Co.	..	8 ½	..
Bower Roller Bearing Co.	18 ½	19 ½	+1 ½
Chevrolet Motor Co.	119	121	..
Commerce Motor Car Co.	6	..	..
Continental Motor Co. com.	5 ¾	5 ¾	+ ¾
Continental Motor Co. pfd.	86	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	178	..	—2
Hall Lamp Co.	..	14 ½	..
Michigan Stamping Co. com.	12 ¾	..	+ ¾
Motor Products	..	..	..
Packard Motor Car Co. com.	95	..	—5
Packard Motor Car Co. pfd.	91	..	..
Paige-Detroit Motor Car Co.	17 ¾	18 ½	..
Prudden Wheel Co.	17 ¾	18 ½	+2 ½
Reo Motor Car Co.	17 ¾	..	— ¾

INACTIVE STOCKS

Atlas Drop Forge	..	30	..
Kelsey Wheel Co.	80	89	..
Regal Motor Car Co.	..	26 ½	..

domestic orders and a government contract for 700 special trucks.

The statement, in part, follows:

Assets	
Cash on hand	\$43,000
Securities	169,174
Accounts receivable	587,689
Plant accounts	537,983
Manufacturer's inventory	1,632,701
Liabilities	
Notes payable	\$507,500
Accounts payable	420,000

New Goodyear Cushion Tire

AKRON, Feb. 18—The Goodyear Tire & Rubber Co. is placing on the market a new type of cushion tire designed to give economical service for delivery work. The tire has been in preparation for more than two years and in cross section somewhat resembles an inverted Y, having a fabric reinforced double base fitting a clincher-flanged rim. A metal

ring around the center holds the double bases of the tire, preventing buckling and eliminating the possibility of twisting or slipping on the rim. The tread has a practical wearing thickness equal to that of similar size solid tires. The tire is made of a specially prepared rubber compound in which are combined great resiliency and toughness.

Harroun to Have Detroit Factory

WAYNE, MICH., Feb. 18—The Harroun Motors Corp. will shortly open a factory branch in Detroit, on automobile row. R. H. Schmittiel will be manager.

82,120 Men in Aviation Section

WASHINGTON, Feb. 13—In less than a year the Aviation Section of the Signal Corps has shown a remarkable growth. On April 1, 1917, the complete section

consisted of 65 officers and 1120 men; on Jan. 1, 1918, there were 3900 officers and 82,120 men.

Michigan Copper Earns \$60 a Share

DETROIT, Feb. 18—Net earnings of the Michigan Copper & Brass Co. for the year ending Dec. 31 were \$596,819.41, after deduction of \$35,000 for income taxes, \$136,000 for excess profits taxes and \$126,000 for depreciation. This is equal to \$60.20 a share on the \$991,350 outstanding common stock.

Assets totaled \$2,735,532.85, compared with \$2,181,827 at the end of 1916. The surplus, after deduction of preferred stock dividends, was \$1,434,009.53. Capital stock outstanding was reduced from \$1,114,850 to \$991,350 through retirement of the preferred stock during the year.

Summary of Business Conditions and Crops Jan. 23, 1918, as Reported From Twelve Federal Reserve Bank Districts

	District No. 1— Boston	District No. 2— New York	District No. 3— Philadelphia	District No. 4— Cleveland	District No. 5— Richmond	District No. 6— Atlanta
General business.....	Active.....	Good; retail trade quiet.	Good.....	Active, limited only by scarcity of supplies.	Large volume.....	Fair.
Crops:						
Condition.....			do.....	Good.....	Inactive.....	do.
Outlook.....			do.....	do.....	Extensive preparations anticipated.	do.
Industries of the district.	Turning more towards Government work.	Active, but hampered by transportation and fuel difficulties.	War industries active; other production retarded.	Decreased output by reason of weather and other conditions.	Running full.....	Handicapped for coal; some labor shortage.
Construction, building, and engineering.	Little new construction except on Government work.	At minimum.....	Very little activity.....	Decrease.....	Private building negligible; Government work in large volume.	Below average.
Foreign trade.....	Heavy imports of raw material.	Decreased export movement because of traffic congestion.	Somewhat greater.....		Restricted.....	Very limited.
Bank clearings.....	Increased.....	Decrease.....	Small increase.....	Increase.....	Large volume.....	Increase.
Money rates.....	Firm and steady.....	Firm.....	Firm.....	Firm.....	Good demand at 6 per cent.	Firm.
Railroad, post office, and other receipts.	Post office increased, railroad decreased.	Increased.....	Heavy; December shows increase.	Post office receipts increased.	Railroad, irregular; post office, volume large.	Good.
Labor conditions.....	Fair; considerable unrest.	Demand greater than supply.	Scarce and inefficient..	Scarcity and exacting.	In demand at high wages.	Fair.
Outlook.....	Unsettled.....	Fair.....	Unsettled.....	Improving.....	Generally satisfactory.	Unsettled, account rapid readjustments.
Remarks.....	Increasing demands for capital purposes and Government financing, scarcity of coal, and transportation difficulties making business hard to conduct.	Course of business and industry during remainder of winter will depend largely on success of efforts to relieve transportation congestion and fuel shortage.	Coal and transportation situation most acute.		General activity above normal for period of year.	
	District No. 7— Chicago	District No. 8— St. Louis	District No. 9— Minneapolis	District No. 10— Kansas City	District No. 11— Dallas	District No. 12— San Francisco
General business.....	Good.....	Generally good	Fair for the season.....	Good.....	Good.....	Active.
Crops:						
Condition.....	do.....	Fair.....		Fair.....	Fair.....	Prospects bettered by recent rains.
Outlook.....	Large acreage wheat.	Favorable.....		More favorable.....	Encouraging.....	
Industries of the district.	Necessary industries active.	Busy, as a rule.....	Active.....	Active.....	Active.....	Very active.
Construction, building, and engineering.	Practically at a standstill.	Dull.....	Slow.....	Declining in volume.	Inactive; seasonal for midwinter.	Decreasing.
Foreign trade.....					Satisfactory.....	Large increase.
Bank clearings.....	Decrease.....	Increase.....	Up.....	Nearly 50 per cent increase.	31 per cent increase over December, 1916.	Largely increasing.
Money rates.....	Firm.....	Firm.....	Steady.....	Steady.....	Easy.....	Firmer.
Railroad, post office, and other receipts.	Post office receipts normal.	Increase in post office receipts.	No change.....		Railroad, increase; post office, 41 per cent increase over 1916.	Increasing.
Labor conditions.....	Generally satisfactory	Labor scarce.....	Good.....	Settled with threatened shortage of farm labor.	Generally satisfactory; some unemployment in unskilled trades.	Unsettled.
Outlook.....	No misgivings.....	Generally favorable ..	do.....	For general increase of all business.	Promising.....	Favorable.
Remarks.....				Prevalent coal and car shortage is serious.	Heavy snow and rain have improved crop conditions, especially wheat; retail trade curtailed; general business satisfactory	Deficient precipitation is at present an unfavorable factor.

Aviation Not Extra Hazardous

WASHINGTON, D. C., Feb. 18—Following a report from Gen. Pershing that aviation is not an extra hazardous service, Secretary Baker yesterday submitted to the Senate Military Committee a bill to repeal all extra pay allowances in the aviation service, averaging about 50 per cent. The measure submitted by Secretary Baker will also create a new grade of aviators to be filled by specially qualified civilians at \$150 a month.

To Watch Over Women Workers

WASHINGTON, Feb. 18—The Ordnance Corps will station women welfare supervisors at every plant where women are engaged in war work, one example being at the plant of the Holt Co., Peoria, Ill.

Kincannon Transmission Elects Officers

BOSCOBEL, WIS., Feb. 18—The Kincannon Silent Transmission Co., organized recently at Boscobel, Wis., by George C. Kincannon, designer and patentee of an improved gearset for motor-driven vehicles, has elected the following officers: President, George C. Kincannon; vice-president, Peter Boebel; secretary, Roy Greenfield; treasurer, Richard Black, and director, Dr. C. L. Jones. For the

present the company will contract with outside machine shops for castings, gears, bearings and parts, although it will manufacture these in a short time. Several manufacturers are negotiating for the use of the patents, and contracts probably will be made on a royalty basis.

Dayton Dealers to Distribute Tractors

DAYTON, Feb. 18—Dayton dealers are preparing to take up the distribution of farm tractors very actively and many of them are at present entering into aggressive campaigns to interest farmers in such equipment.

Department to Newark, N. J.

EAST PITTSBURGH, Feb. 18—The Automobile Equipment department of the Westinghouse Electric & Mfg. Co., will on Feb. 15 be removed to the company's Newark, N. J., plant. At the same time the general sales offices of the company will be moved to 110 West Forty-second Street, New York, where the Eastern district sales office will be located. S. D. Levings has resigned as Eastern representative of the company.

NEW YORK, Feb. 19—The Bourne Magnetic Truck Co. has moved its factory and offices to Fifth avenue and 142d street.

Many New Plants in Cleveland

CLEVELAND, OHIO, Jan. 17—A marked growth in the automotive industries of this city is shown by the building permits obtained in the past year. The following are several of these, following the extent of the use:

Plant	Location	Estimated Cost
Cleveland	Welding & Mfg. Co., 2145 W. 117th Street.....	\$60,000
Cleveland	Welding & Mfg. Co., 2145 W. 117th Street.....	40,000
Warner & Swasey Co., 5701 Cedar Avenue		60,000
American Steel & Wire Co., Ohio Canal and Harvard Road.....		25,000
Park Drop Forge Co., 750 E. 79th Street		60,000
Park Drop Forge Co., 750 E. 79th Street		36,000
Grant Motor Corp., 12641 Taft Avenue		65,000
U. S. Tool Co., 3140-64 W. 106th.....		25,000
Lang Body Co., 3086 W. 106th.....		75,000
Parrish & Bingham Co., 10600 Madison		80,000
Hydraulic Pressed Steel Co., Hydraulic and E. 61st Street.....		30,000
Hydraulic Pressed Steel Co., Hydraulic and E. 61st Street.....		300,000

Calendar

ASSOCIATIONS

June 5-12—Hot Springs, Va. National Assn. Automobile & Accessory Jobbers.

SHOWS

Feb. 16-23—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn., Robert E. Lee, Mgr.
Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn., State Armory.
Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.
Feb. 18-23—Syracuse, N. Y., Syracuse Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.
Feb. 18-23—Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome. Henry B. Marks, Mgr.
Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.
Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory. Claude E. Holgate, Mgr.
Feb. 18-23—Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.
Feb. 18-23—Waterbury, Conn., United Shows Co.
Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.
Feb. 18-23—Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum. J. L. Elliott, Mgr.
Feb. 20-23—Quincy, Ill., First Annual Armory. L. B. Bartlett, Mgr.
Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks, Mar. 5-9.
Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn., Auditorium. Clarke G. Powell, Mgr.
Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.
Feb. 25-Mar. 2—Muskegon, Mich., Second Annual, Merrill Auditorium. John C. Fowler, Mgr.
Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors' Co. W. W. Freeman, Mgr.
Feb. 27-Mar. 2—Burlington, Iowa, Cars, Trucks & Accessories.
Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.
Mar. 1-15—Lyons, France, Third Sample Fair.
Mar. 2-9—Boston, Mass., Boston Auto Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.
Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.
Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.
Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.
Mar. 6-9—Mason City, Iowa, Annual Car and Truck. Automobile Dealers' Assn.
Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.
Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.
Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.
Mar. 13-16—Raleigh, N. C., Auditorium. John Kelley, Mgr.
Mar. 13-16—Warren, Pa., Warren Automobile Dealers' Assn., Russell Garage.
Mar. 13-16—Peoria, Ill., Peoria Auto. Accessories Dealers' Assn. W. O. Ireland, Mgr.
Mar. 14-16—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.
Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.
Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.
Mar. 20-22—Houlton, Me., Second Annual, Houlton Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luther, Mgr.

Mar. 20-23—Holdrege, Neb., Second Annual of Southwest Nebraska.
Mar. 20-23—Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.
Mar. 25-30—Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.
Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.
Mar. 30-Apr. 6—Atlantic City, N. J., Second Annual, Garden Pier. S. W. Megill, Mgr.
Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Feiffer, Mgr.
Apr. 6-8—Green Bay, Wis., Brown County Automobile Trade Assn.
Apr. 6-13—Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.
Apr. 8-13—Reading, Pa., Reading Automobile Trade Assn.
Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.
Apr. 17-20—Calumet, Mich., Upper Peninsula Show, Conner County Automobile Dealers & Garage Owners' Assn., Coliseum.
Sept. 23-28—Chicago, National Accessory Show for Fords, Coliseum.

ENGINEERING

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